

TEST SERIES GATE 2018

BOOKLET SERIES **A**

Paper Code: CY

Test Type: **TEST SERIES**

Duration: 3:00 Hours

CHEMISTRY-CY

Date: 08-01-2018

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 one of the following options is the closest in meaning to the word given below?
Abrogate
(a) Freedom (b) abolish (c) begin (d) coercion
- Which one of the following options is the closest in meaning to the word given below?
Fecund
(a) Fruitful (b) Fruitless (c) Juicy (d) Smooth
- If a and b are real numbers and $a > b$, then which of the following is true always
(a) $|a| > |b|$ (b) $a^2 > b^2$ (c) $a(a+1) > b(b+1)$ (d) $2b-1 < 2a-1$
- The difference between the squares of two consecutive odd integers is always divisible by which of the following numbers.
(a) 6 (b) 8 (c) 12 (d) 16
- If the sum of five consecutive integers is S , what is the largest of those integers in terms of S ?
(a) $\frac{S-10}{5}$ (b) $\frac{S-10}{4}$ (c) $\frac{S+10}{5}$ (d) $\frac{S-10}{10}$

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

- Choose the most appropriate word from the options given below to complete the following sentence.
Prior to liberalization _____ computer industries, the Indian Government's policy was on self reliance through import substitution.
(a) Of (b) At (c) In (d) None of the above
- What will come in place of ? mark?

5		8
	126	
9		6

4		9
	78	
6		7

4		12
	?	
11		5

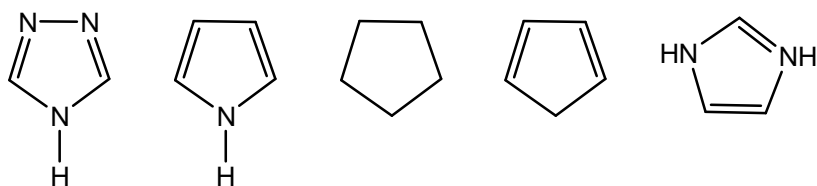
- (a) 240 (b) 336 (c) 180 (d) none of these
- The question below consists of a pair of related words followed by four pairs of words. Select the pair that best expresses the relation in the original pair:
Exercise: Strong
(a) Perform: Timid (b) Guard: Alert (c) Decide: Shrewd (d) Read: Knowledgeable
- What is the remainder when $2^{11}(2^{10}+1)$ is divided by 15
(a) 2 (b) 3 (c) 5 (d) 10
- Karan and Arjun run a 100 metre race, where Karan beats Arjun by 10 metres. To do a favour to Arjun, Karan starts 10 metres behind the starting line in a second 100 metre race. They both run at their earlier speeds which of the following is true in connection with the second race?
(a) Karan and Arjun reach the finishing line simultaneously
(b) Arjun beats Karan by 1 metre.
(c) Arjun beats Karan by 11 metre.
(d) Karan beats Arjun by 1 metre.

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

- The correct pair of lanthanoids having lower boiling and melting point?
(a) Gd and Lu (b) Eu and Yb (c) Eu and Lu (d) Ce and Pr
- The correct criterion of spontaneity among the following is
(a) $(\partial S)_{U,V} \geq 0$ (b) $(\partial S)_{H,V} \geq 0$ (c) $(\partial S)_{H,P} \leq 0$ (d) $(\partial S)_{U,P} \leq 0$

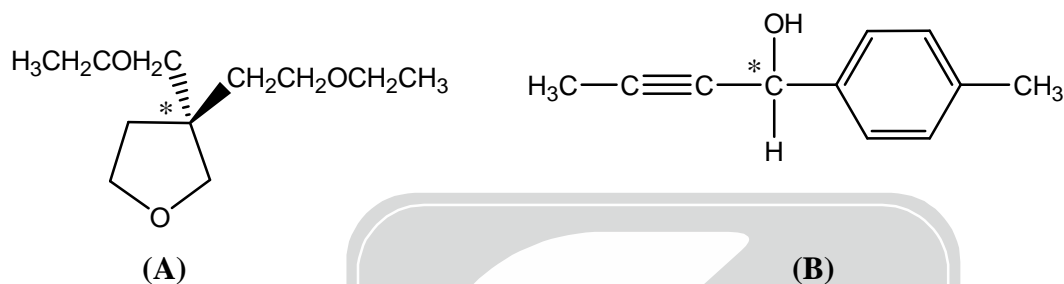


13. The ratio of velocity of cation and anion is 1 : 2. The transport number of cation in the solution is
 (a) 0.50 (b) 0.75 (c) 0.33 (d) 0.90
14. Correct decreasing order of pK_a value of the following compounds is

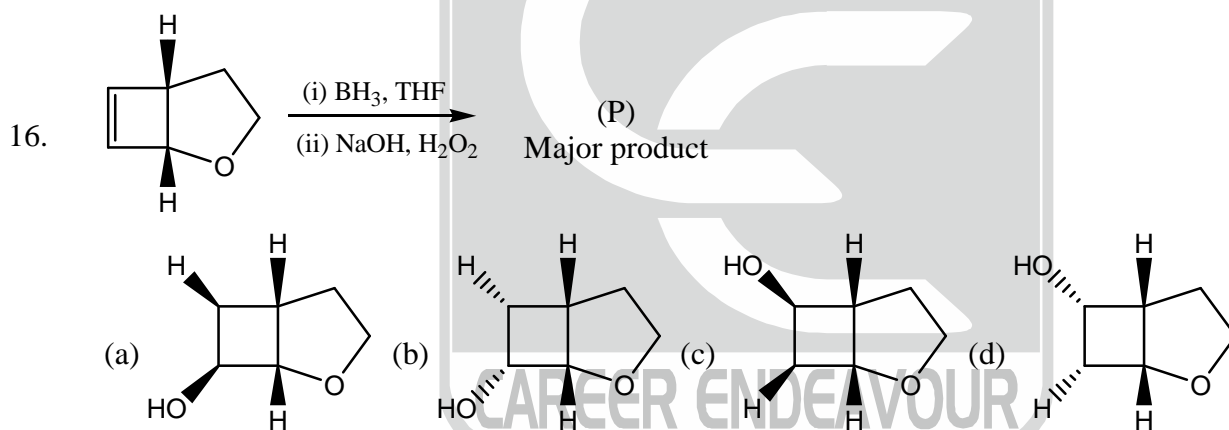


(A) (B) (C) (D) (E)

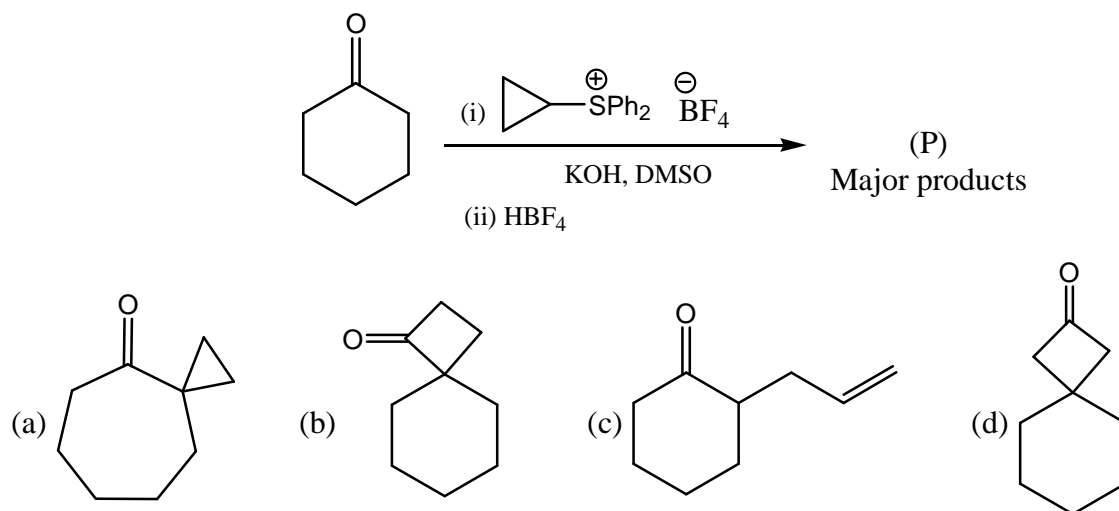
- (a) $A > B > C > D > E$ (b) $C > B > D > A > E$
 (c) $E > A > D > B > C$ (d) $C > B > E > D > A$
15. Find out the absolute configuration of the astericked chiral centres of each of the following compounds (A and B) are, respectively

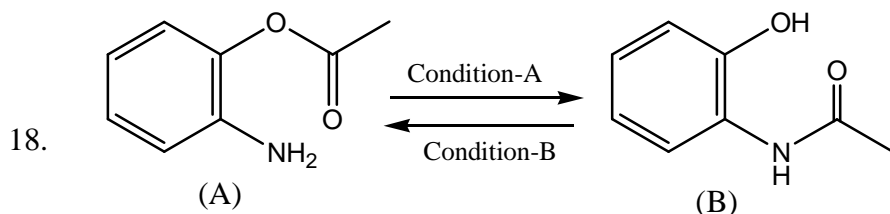


(a) R, R (b) R, S (c) S, S (d) S, R



17. The major product (P) is

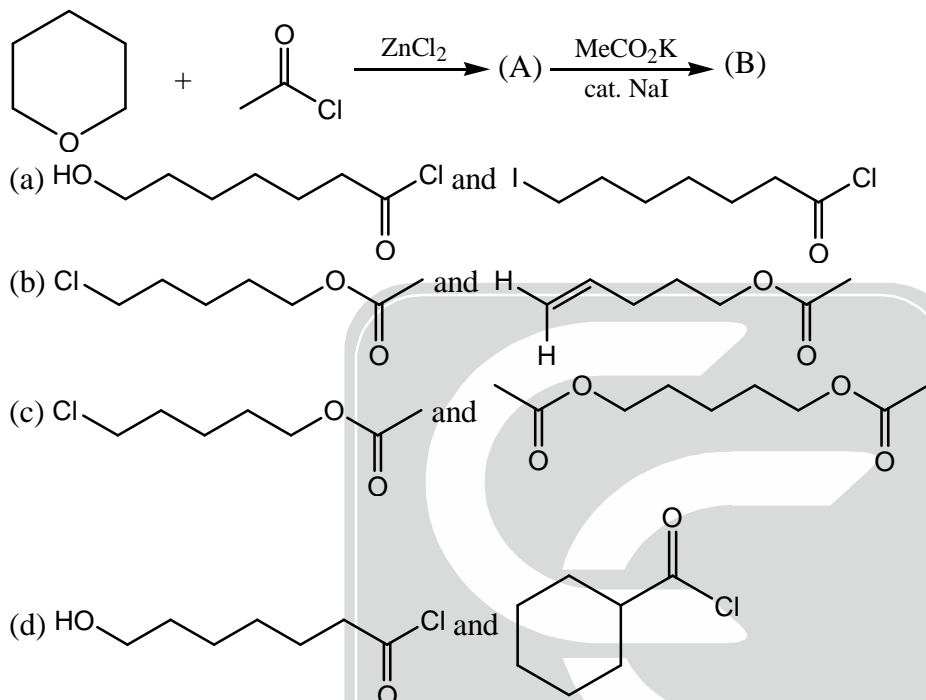




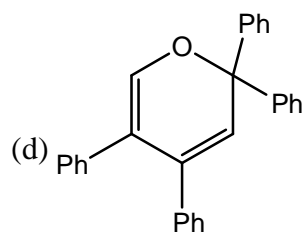
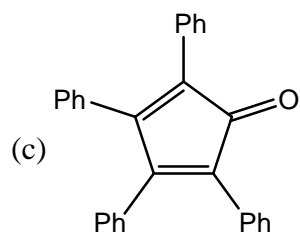
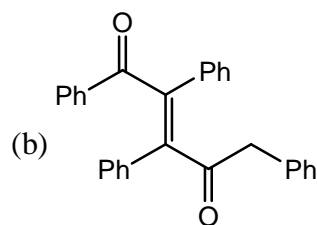
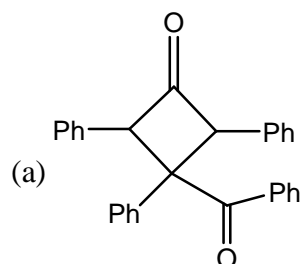
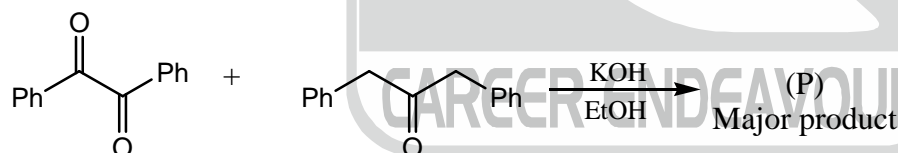
Incorrect option regarding to the conversion of product (A & B)

- (a) Product A convert into product B by acid as a condition A
 (b) Product B convert into product A by base as a condition B
 (c) In the formation of product B from product A and product A from B, same intermediate is formed
 (d) Different intermediate is formed in the conversion of A to B and B to A.

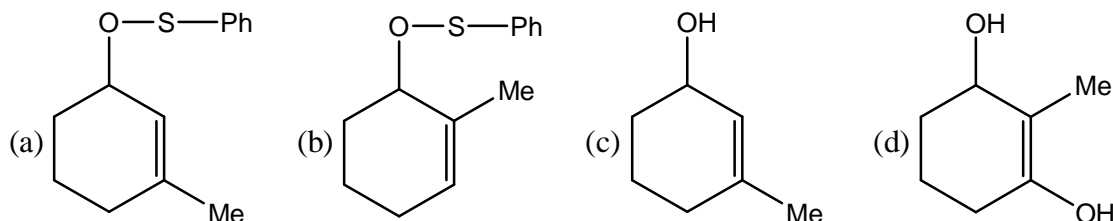
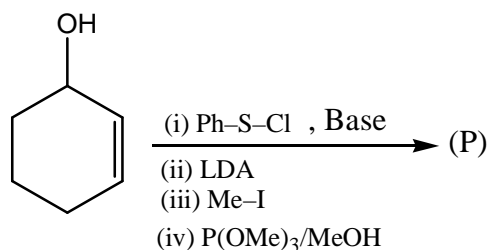
19. The major product formed (A) and (B) are, respectively



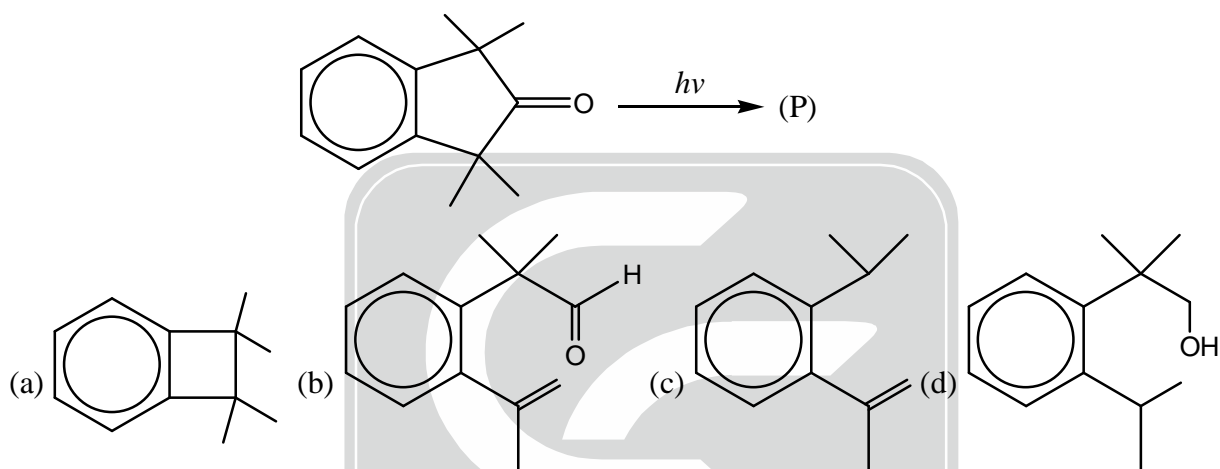
20. The major product (P) is



21. The major product (P),



22. The major product (P) is



23. An electron is confined in a cubic box of side 'a'. The degeneracy of the state having momentum $\frac{3\pi\hbar}{a}$ is _____

24. The Hermitian operator(s) is/are



25. U^{235} nucleus splits into two new nuclei whose mass numbers are in the ratio of 2 : 1. The ratio of the radii of the new nuclei is



26. In a magnetic field of strength 2.349 T, the resonance frequency of ^{15}N nuclei is 10.13 MHz. The resonance frequency of ^{15}N in a magnet of 11.745T is _____ Hz.

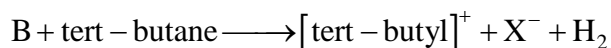
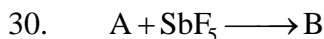
27. If 0.0033 M of a substance quenches the fluorescence efficiency by 25%. The value of the stern volmer constant in M^{-1} is _____

28. $[\text{Cp}_2\text{Fe}]^+$ (ferrocinium cation) is given in coloured and paramagnetic. The colour arises due to



29. Which of the following types of silicate represents the mineral $\text{Mg}_3(\text{OH})_2[\text{Si}_4\text{O}_{10}]$?





then A is

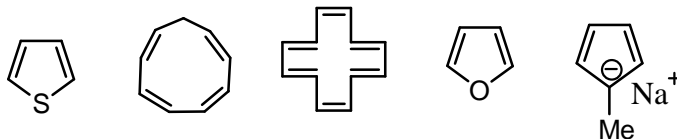
- (a) HCl (b) HF (c) HBr (d) HI

31. The most populated rotational state for HCl ($B = 8.5 \text{ cm}^{-1}$) at 300 K is _____

32. The experimental magnetic moment of $K_3[Fe(CN)_6]$ is $2.3 \mu_B$ and is attributable to the

- (a) spin-only value of a low-spin Fe (b) spin-only value of a high-spin Fe
(c) low-spin Fe with orbital contribution (d) high-spin Fe with orbital contribution

33. Which of the following compounds would you expect to be aromatic



- (i) (ii) (iii) (iv) (v)
(a) i, iii, v (b) i, ii, v (c) i, iv, v (d) ii, iv, v

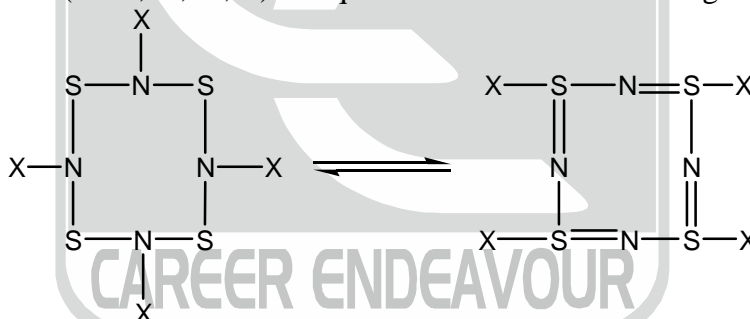
34. Two aqueous uni-univalent electrolyte system A and B are at different temperature T_A and T_B and C_A and C_B

concentrations, respectively. Their Debye-Hückel lengths will equal if $\frac{T_A}{C_A} \times \frac{C_B}{T_B}$ will be _____

35. In Langmuir adsorption of a gas onto a solid surface the value of slope and intercept was found to be 0.45 cm^{-3} and $5 \times 10^3 \text{ Torr cm}^{-3}$. The value of distribution coefficient will be _____

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

36. Correct order of substituent ($X = F, Cl, Br, H$) for equilibrium constant of following reaction is



- (a) $H > F > Cl > Br$ (b) $F > Cl > Br > H$ (c) $F > Cl > H > Br$ (d) $F > Br > Cl > H$

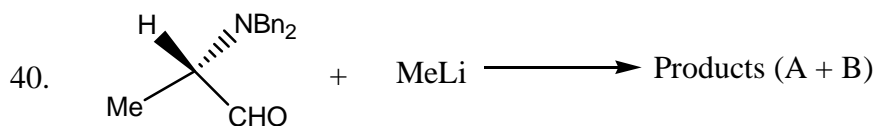
37. The slope of a plot of pressure Vs temperature is $3.15 \times 10^{-4} \text{ atm K}^{-1}$ at 500K. The change in volume of a substance at the given temperature, if enthalpy of transition is $5 \times 10^4 \text{ J mol}^{-1}$, is

- (a) $2.85 \times 10^5 \text{ L}$ (b) $2.81 \times 10^3 \text{ L}$ (c) $2.8 \times 10^4 \text{ L}$ (d) 28 L

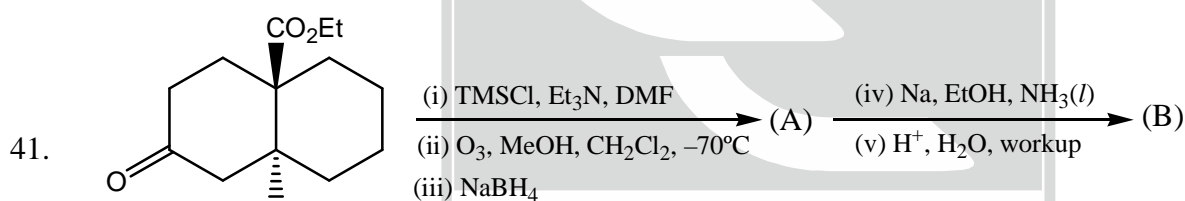
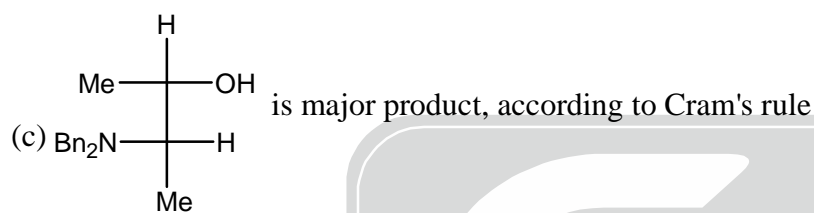
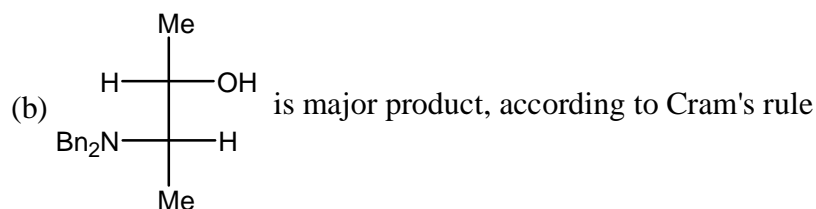
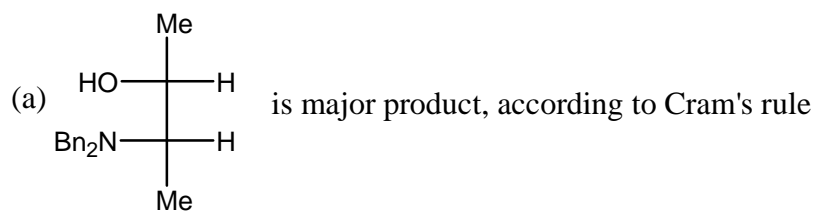
38. In the beginning of polarographic experiment of 10^{-3} M the current observed was $0.1 \mu\text{A}$. After the experiments the maximum current observed was $10.1 \mu\text{A}$. The diffusion current observed for a solution of 10^{-5} M solution is _____

39. 20 mL of 0.01M HCl is titrated with 10 mL of 0.01 M $Ca(OH)_2$. The pH of the solution at 25°C is

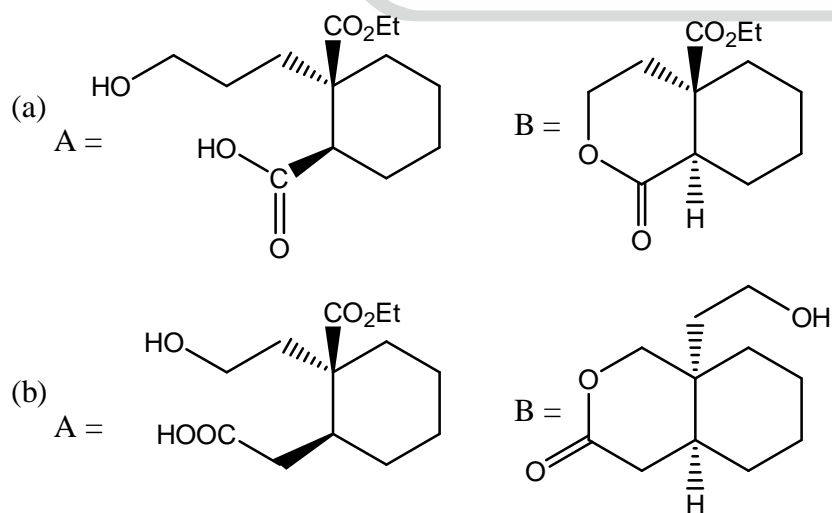
- (a) Less than 7 (b) More than 7 (c) Equal to 7 (d) Cannot predict

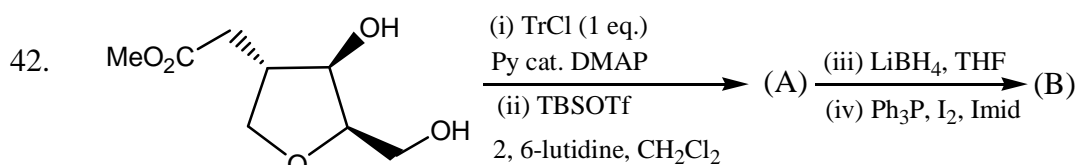
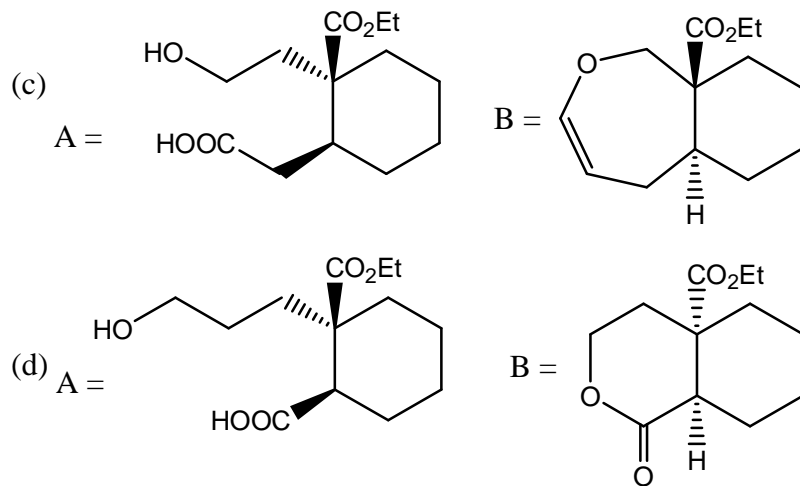


Incorrect option regarding product (A and B) with appropriate statement

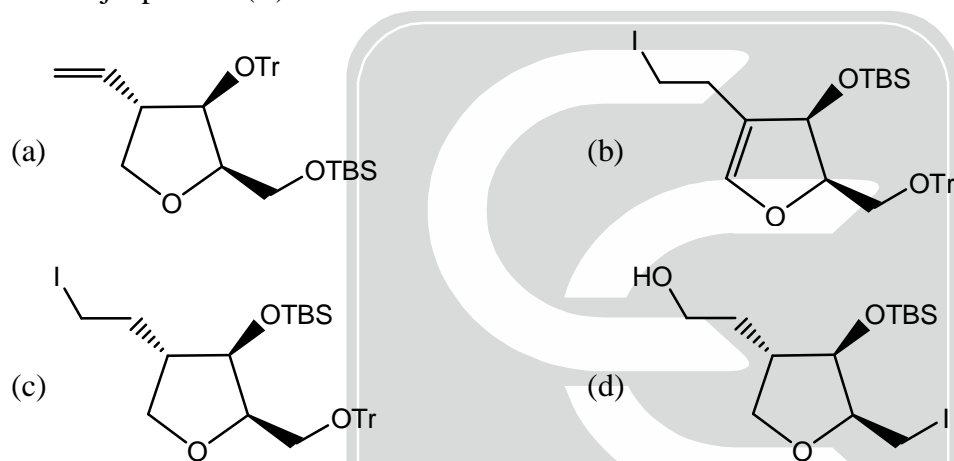


The major product (A) and (B) formed, respectively, are

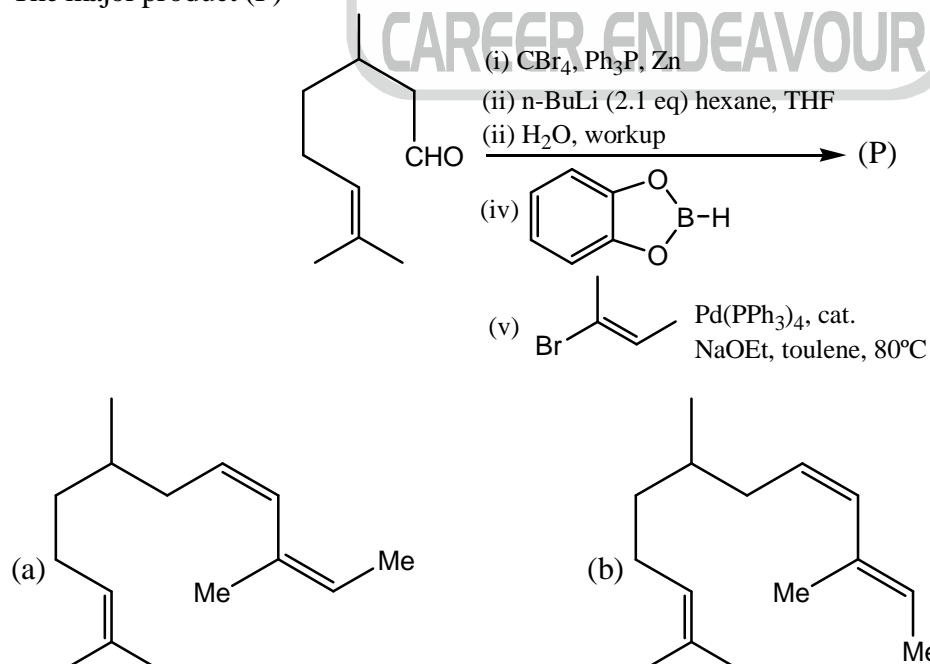


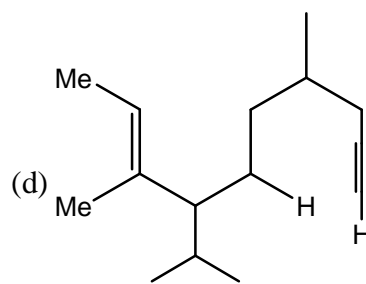
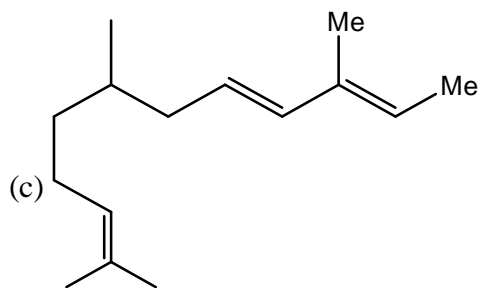


The major product (B) is

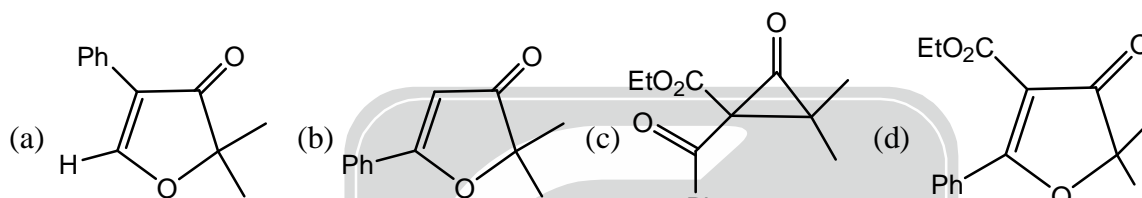
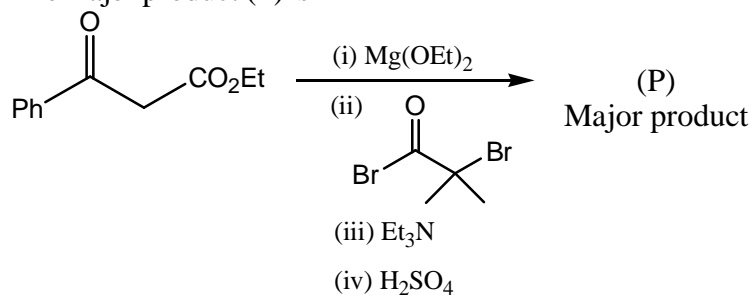


43. The major product (P) is

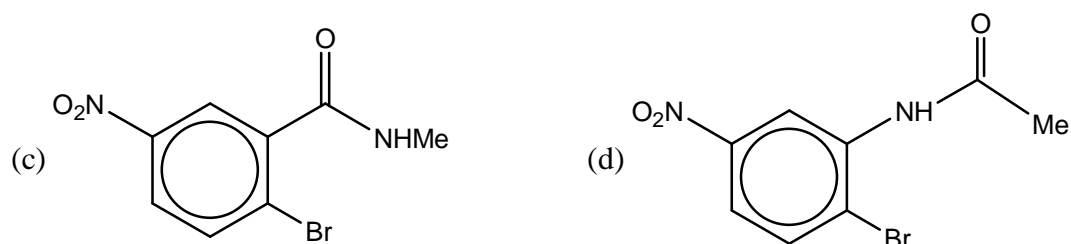
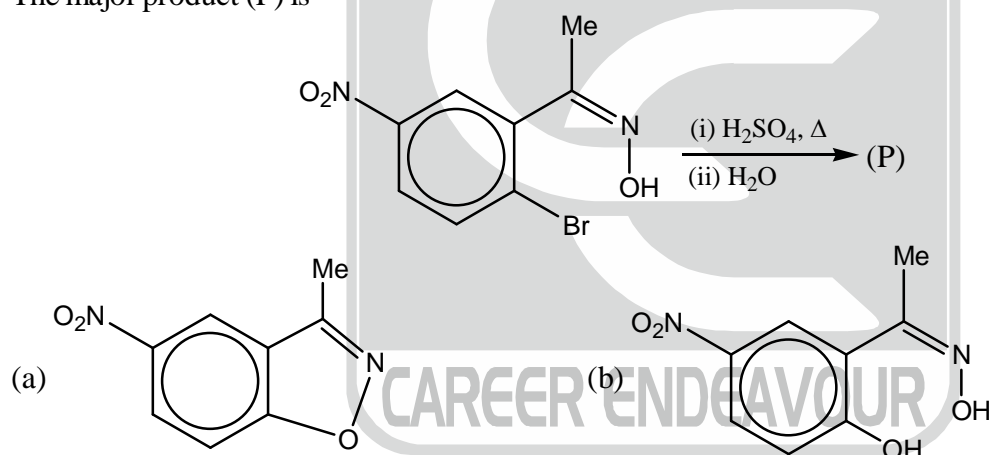




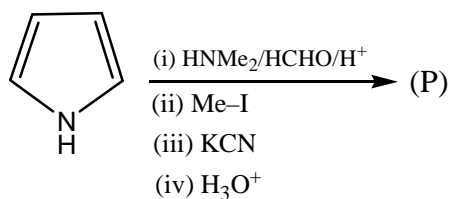
44. The major product (P) is

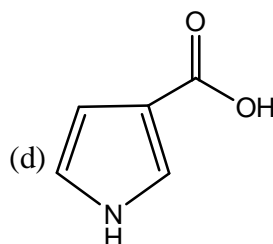
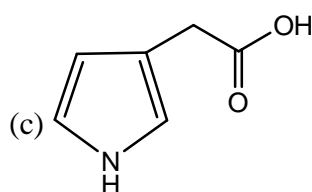
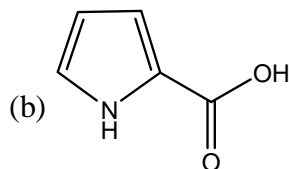
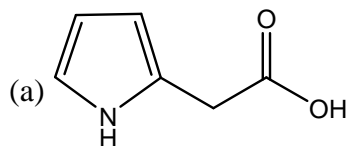


45. The major product (P) is

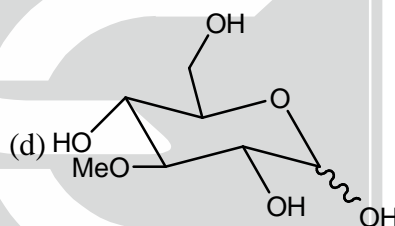
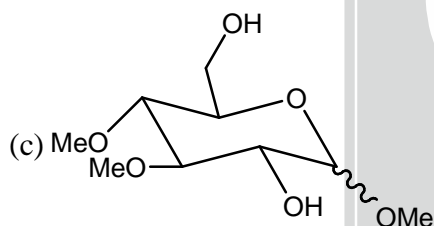
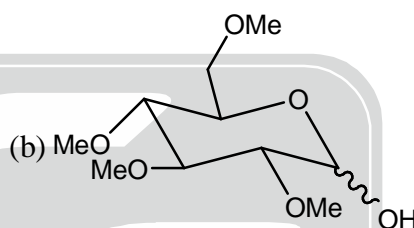
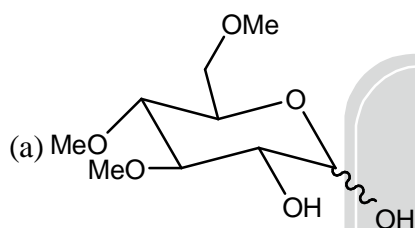
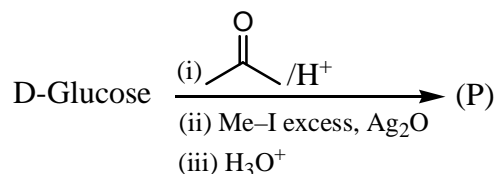


46. The major product (P) is





47. The major product (P) is



48. Consider the following statements

(A) For a system in thermodynamics equilibrium, the population of molecular energy levels always decreases as the energy levels increases

(B) It is impossible for a higher energy molecular state to have a greater population of molecule than lower energy state

(C) For a thermodynamics system in equilibrium molecular state that have same energy must have same population

(a) True, False, True (b) False, True, False (c) False, False, False (d) False, False, True

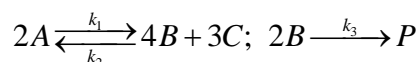
49. In case of NH_3 molecule, the direct product E(X)E will have the dimensions

(a) 4 (b) 6 (c) 8 (d) 12

50. The structure factor of a fcc lattice for (111) planes

(a) 0 (b) 1 (c) 2 (d) 4

51. For the following sequence of reactions



The $\frac{d[B]}{dt}$ is given by

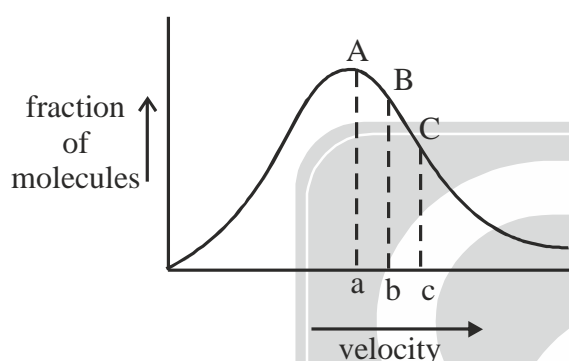
- (a) $\frac{1}{4}k_1[A]^2 - \frac{1}{4}k_2[B]^4[C]^3 - \frac{1}{2}k_3[B]^2$ (b) $\frac{1}{2}k_1[A]^2 - \frac{1}{2}k_2[B]^4[C]^3 - k_3[B]^2$
 (c) $2k_1[A]^2 - 2k_2[B]^4[C]^3 - k_3[B]^2$ (d) $4k_1[A]^2 - 4k_2[B]^4[C]^3 - 2k_3[B]^2$

52. Consider a particle of mass 'm' moving under a potential of the form

$$V(x) = \begin{cases} \frac{1}{2}kx^2 & \text{for } x > 0 \\ \infty, & \text{otherwise} \end{cases}$$

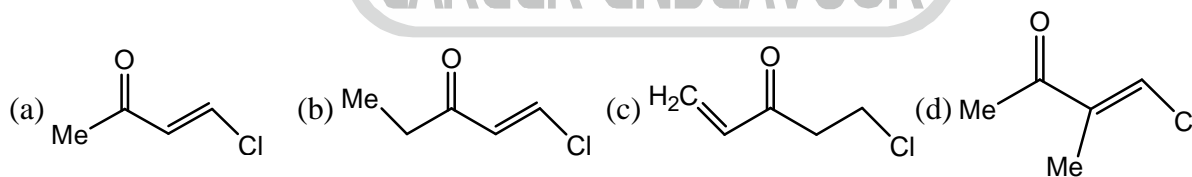
The 3rd excited state corresponds to n equals

- (a) 3 (b) 5 (c) 7 (d) none
53. The correct intensity of Mössbauer lines for potassium ferricyanide in the effect of external magnetic field will be.
 (a) 3:4:1:3:4:1 (b) 1:3:4:4:3:1 (c) 3:5:1:1:5:3 (d) 3:4:1:1:4:3
54. Distribution of velocity of molecules is represented by the curve as shown

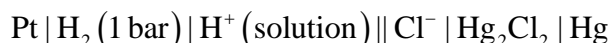


velocities at point *a*, *b* and *c* represents average velocity, most probable velocity and rms velocity (not necessarily in that order). Point *b* represents which of the following velocity

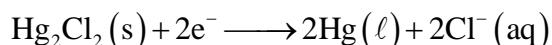
- (a) $\sqrt{\frac{3RT}{M}}$ (b) $\sqrt{\frac{2RT}{M}}$ (c) $\sqrt{\frac{8RT}{\pi M}}$ (d) $\sqrt{\frac{2RT}{\pi M}}$
55. Propionyl chloride is reacted with acetylene gas in presence of $AlCl_3$ an obtained compound A. The NMR data of compound A are given, identify it.
A: 1H NMR: 0.96 (t, J 7.0 Hz, 3H), 2.40 (q, J 7.0 Hz, 2H), 6.31 (d, J 14.0 Hz, 1H), 7.11 (d, J 14.0 Hz, 1H).



56. At 298K, the EMF of the cell

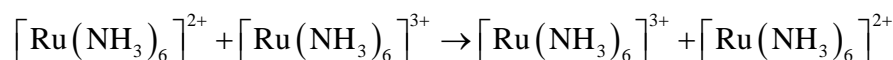


is 0.7530 V. If pH of the solution is 8. The value of E^0 is _____ volt.

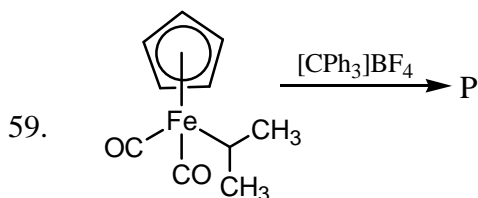


57. The crystal of $KCoF_3$ show three absorption bands in its absorption spectrum at 7150 cm^{-1} , 15200 cm^{-1} and 19200 cm^{-1} . In this compound Co^{2+} ion is surrounded octahedrally by six F^- ligands. The magnitude of Δ_0 is _____ (cm^{-1}).

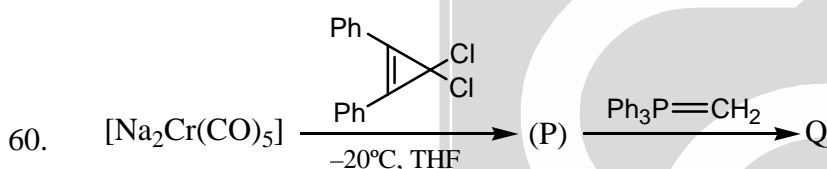
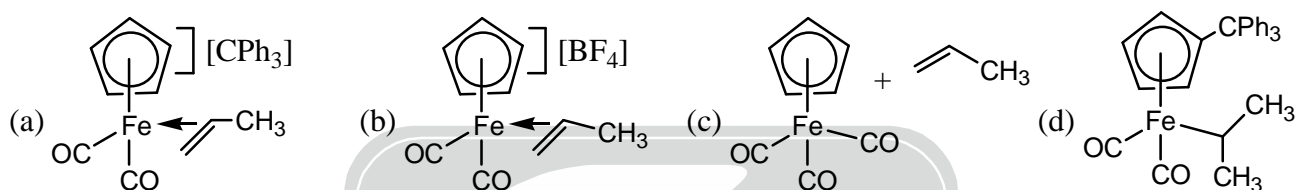
58. The rate of electron transfer in the following reaction is rapid because



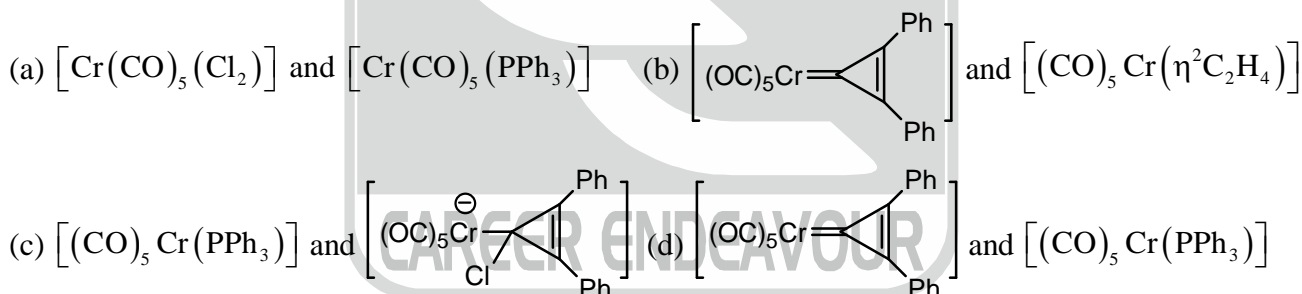
- (a) It is an inner sphere reaction
 (b) It is an outer sphere reaction.
 (c) Electron transfer takes place from π^* of $[\text{Ru}(\text{NH}_3)_6]^{2+}$ to π^* of $[\text{Ru}(\text{NH}_3)_6]^{3+}$ without any input of energy.
 (d) Electron transfer takes place from σ^* of $[\text{Ru}(\text{NH}_3)_6]^{2+}$ to σ^* of $[\text{Ru}(\text{NH}_3)_6]^{3+}$ with any input of energy.



The major product 'P' in the above reaction is



The major product P and Q in the above synthetic transformation are respectively

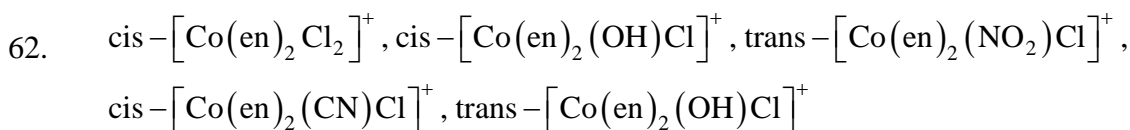


61. Identify correct statement for mercury as an environment pollutant

- (A) carbanionic biomethylation converts it to MeHg^+
 (B) thiol group of cysteine has strong affinity for mercury
 (C) mercury containing industrial catalyst release caused minimata disease

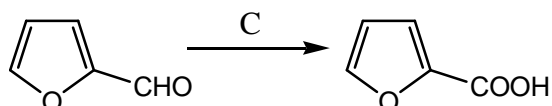
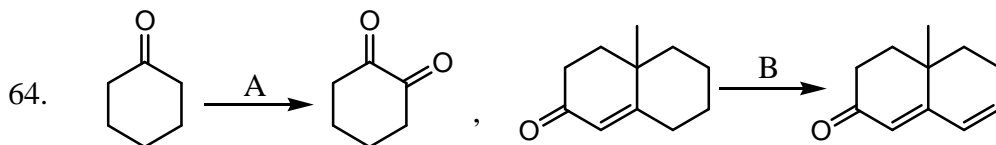
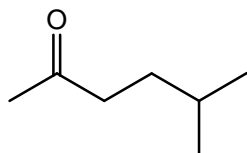
The correct answer is

- (a) A and B (b) A and C (c) B and C (d) A, B and C



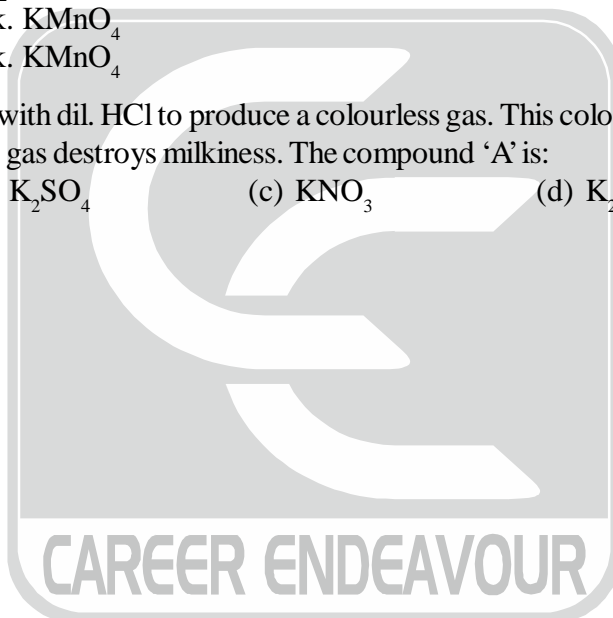
The complexes which show retention in configuration on acidic hydrolysis are _____

63. The m/z value of the detectable fragment formed by McLafferty like rearrangement of the following compound in mass spectrometer is _____



Choose the correct statement regarding A, B and C

- | | A | B | C |
|-----|------------------|------|------------------------|
| (a) | SeO ₂ | DDQ | Ag ₂ O |
| (b) | PCC | DDQ | Ag ₂ O |
| (c) | SeO ₂ | Pd/C | Alk. KMnO ₄ |
| (d) | PCC | DDQ | Alk. KMnO ₄ |
65. A potassium salt 'A' reacts with dil. HCl to produce a colourless gas. This colourless gas turns lime water milky and the excess of this gas destroys milkiness. The compound 'A' is:
- (a) KCl (b) K₂SO₄ (c) KNO₃ (d) K₂CO₃.



Space for rough work



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CHEMISTRY - CY**GATE TEST SERIES-A****Date: 08-01-2018****ANSWER KEY**

- | | | | | |
|--------------------|--------------------|------------------|--------------|----------------|
| 1. (b) | 2. (a) | 3. (d) | 4. (b) | 5. (c) |
| 6. (a) | 7. (b) | 8. (d) | 9. (d) | 10. (d) |
| 11. (b) | 12. (a) | 13. (c) | 14. (b) | 15. (c) |
| 16. (a) | 17. (b) | 18. (d) | 19. (c) | 20. (c) |
| 21. (c) | 22. (c) | 23. (3 to 3) | 24. (b) | 25. (a) |
| 26. (49.5 to 50.5) | 27. (905 to 915) | 28. (c) | 29. (d) | 30. (b) |
| 31. (2.9 to 3.1) | 32. (c) | 33. (c) | 34. (1 to 1) | 35. (88 to 92) |
| 36. (b) | 37. (b) | 38. (0.1 to 0.1) | 39. (c) | 40. (b) |
| 41. (b) | 42. (c) | 43. (c) | 44. (b) | 45. (c) |
| 46. (a) | 47. (d) | 48. (d) | 49. (a) | 50. (d) |
| 51. (d) | 52. (c) | 53. (d) | 54. (c) | 55. (b) |
| 56. (0.26 to 0.30) | 57. (8040 to 8060) | 58. (c) | 59. (b) | 60. (d) |
| 61. (d) | 62. (4 to 4) | 63. (58 to 58) | 64. (a) | 65. (d) |

