Roll No. | | | | | | | | |

(Write Roll Number from left side exactly as in the Admit Card)

Signature of Invigilator

Question Booklet Series **X**

PAPER–II

Question Booklet No.
(Identical with OMR Answer Sheet Number)

Subject Code : 12

CHEMICAL SCIENCES

Time : 2 Hours *Maximum Marks: 200*

Instructions for the Candidates

1. Write your Roll Number in the space provided on the top of this page as well as on the OMR Sheet provided.
2. At the commencement of the examination, the question booklet will be given to you. In the first 5 minutes, you are requested to open the booklet and verify it:
   (i) To have access to the Question Booklet, tear off the paper seal on the edge of this cover page.
   (ii) Faulty booklet, if detected, should be got replaced immediately by a correct booklet from the invigilator within the period of 5 (five) minutes. Afterwards, neither the Question Booklet will be replaced nor any extra time will be given.
   (iii) Verify whether the Question Booklet No. is identical with OMR Answer Sheet No.; if not, the full set is to be replaced.
   (iv) After this verification is over, the Question Booklet Series and Question Booklet Number should be entered on the OMR Sheet.
3. This paper consists of One hundred (100) multiple-choice type questions. All the questions are compulsory. Each question carries *two* marks.
4. Each Question has four alternative responses marked: (A) (B) (C) (D) . You have to darken the circle as indicated below on the correct response against each question.

   Example: (A) (B) ● (D), where (C) is the correct response.
5. Your responses to the questions are to be indicated correctly in the OMR Sheet. If you mark your response at any place other than in the circle in the OMR Sheet, it will not be evaluated.
6. Rough work is to be done at the end of this booklet.
7. If you write your Name, Phone Number or put any mark on any part of the OMR Sheet, except in the space allotted for the relevant entries, which may disclose your identity, or use abusive language or employ any other unfair means, such as change of response by scratching or using white fluid, you will render yourself liable to disqualification.
8. Do not tamper or fold the OMR Sheet in any way. If you do so, your OMR Sheet will not be evaluated.
9. You have to return the Original OMR Sheet to the invigilator at the end of the examination compulsorily and must not carry it with you outside the Examination Hall. You are, however, allowed to carry question booklet and duplicate copy of OMR Sheet after completion of examination.
10. **Use only Black Ball point pen.**
11. **Use of any calculator, mobile phone, electronic devices/gadgets etc. is strictly prohibited.**
12. **There is no negative marks for incorrect answer.**

PAPER II

(CHEMICAL SCIENCES)

1. A Fe-compound shows two lines in the Mossbauer spectra and the separation between these two lines is temperature dependent. The compound is

(A) High spin Fe (II)

(B) Low spin Fe (II)

(C) High spin Fe (III)

(D) The data are not adequate for any such prediction.

2. On increasing the sample size, the systematic constant error will

(A) decrease.

(B) increase.

(C) remain unchanged.

(D) decrease until a certain size is reached and then increase.

3. Voltammetric techniques that include convection by stirring of solution are called

(A) Polarography

(B) Differential Pulse Polarography

(C) Hydrodynamic Voltammetry

(D) Anode Stripping Voltammetry

4. Capacity of anion exchanger resin

(A) decreases with decrease in pH.

(B) decreases with increase in pH.

(C) is maximum at pH = 7.

(D) is not affected by pH.

5. Consider the ions, Eu(III), Gd(III), Sm(III) and Tb(III).

The observed and calculated magnetic moment values differ most for the ions:

(A) Eu(III), Tb(III)

(B) Sm(III), Gd(III)

(C) Sm(III), Eu(III)

(D) Gd(III), Tb(III)

6. Indentify the correct statements.

(i) Spectral band due to $f \leftrightarrow f$ transition is broader than $d \leftrightarrow d$ transition.

(ii) Spectral band due to $f \leftrightarrow f$ transition is less intense than $d \leftrightarrow d$ transition.

(iii) Spectral band due to $f \leftrightarrow d$ transition is more intense than either $f \leftrightarrow f$ or $d \leftrightarrow$ d transition.

(iv) $f \leftrightarrow d$ transition for Gd^{3+} is of higher energy than Eu^{2+}.

(A) (i), (ii) and (iv)

(B) (ii), (iii) and (iv)

(C) (ii) and (iii) only

(D) (iii) and (iv) only

7. Solid-to-solid phase transition can be detected by

(A) TGA

(B) DTG

(C) Simultaneous TGA–DTG

(D) Simultaneous TGA–DTA

8. Which one of the following compounds shows the highest solubility in hot concentrated aqueous KOH?

(A) $La(OH)_3$

(B) $Ce(OH)_3$

(C) $Gd(OH)_3$

(D) $Yb(OH)_3$

9. Stability order of +1 oxidation state compared to that of +3 oxidation state of the following Gr.13 elements is

(A) Tl > Ga > In

(B) Ga > In > Tl

(C) In > Tl > Ga

(D) Tl > In > Ga

10. The term symbol of the ground state of carbon is

(A) $^3P_0$

(B) $^3P_2$

(C) $^3P_1$

(D) $^3F_2$

11. The first ionisation energy of the following Gr.13 elements follows the order:

(A) B > In > Tl

(B) B > Tl > In

(C) Tl > In > B

(D) In > Tl > B

12. The correct set of quantum numbers representing the outer most electron in the ground state of Boron atom is

(A) n = 2, l = 0, m = +1, s = + ½

(B) n = 2, l = 1, m = –1, s = + ½

(C) n = 2, l = 1, m = +2, s = + ½

(D) n = 2, l = 0, m = 0, s = + ½

13. Paramagnetic species among B_2, NO, N_2, O_2^{2-} are

(A) B_2 and NO only

(B) B_2, NO and O_2^{2-}

(C) NO only

(D) B_2 only

14. The set of iso-structural species is

(A) SF_4 and BF_4^-

(B) SF_4 and XeF_4

(C) XeF_4 and $[PdCl_4]^{2-}$

(D) XeF_4 and $[NiCl_4]^{2-}$

15. Correct representation of Zeise's salt is

(A) $K[PtCl_2(\eta^2 - CH_2 = CH_2)]$

(B) $K[PtCl_3(\eta^2 - CH_2 = CH_2)]$

(C) $[PtCl_3(\eta^2 - CH_2 = CH_2)]$

(D) $K_2[PtCl_2(\eta^2 - CH_2 = CH_2)]$

16. The quaternary structure of human hemoglobin is a

(A) dimer of two myoglobin dimer.

(B) tetramer of identical subunits.

(C) tetramer of four different subunits.

(D) tetramer of two different subunits.

17. Hemerythrin belongs to the group of

(A) non-heme iron protein

(B) binuclear copper protein

(C) heme-iron protein

(D) non-heme non-iron protein

18. The number of Mo – Mo bond present in $[(\eta^5 - C_5H_5)\,Mo(CO)_2]_2^{2-}$ is

(A) zero

(B) three

(C) two

(D) one

19. π –acidity of the ligands Me_3N, C_2H_4, C_2Cl_4 and CO follows the order

(A) $CO > C_2H_4 > C_2Cl_4 > Me_3N$

(B) $Me_3N > C_2Cl_4 > C_2H_4 > CO$

(C) $CO > Me_3N > C_2H_4 > C_2Cl_4$

(D) $CO > C_2Cl_4 > C_2H_4 > Me_3N$

20. A mixture of NaCl, $K_2Cr_2O_7$ and H_2SO_4(c) was heated in a dry test tube. The evolved volatile compound (X) was treated with NaOH solution to form a yellow solution of (B), which upon reaction with $Pb(CH_3COO)_2$ and acetic acid gave a yellow precipitate of $PbCrO_4$. The identity of 'X' is

(A) Na_2CrO_4

(B) CrO_2Cl_2

(C) $CrOCl_2$

(D) $CrCl_3$

21. The borax-bead is a mixture of

(A) $NaBO_3 + B_2O_3$

(B) $Na_2B_4O_7 + B_2O_3$

(C) $Na_2BO_2 + B_2O_3$

(D) $NaBO_2 + B_2O_3$

22. Which one of the following species *DOES NOT* have S – S bond?

(A) $S_2O_3^{2-}$

(B) $S_2O_5^{2-}$

(C) $S_2O_8^{2-}$

(D) $S_2O_4^{2-}$

23. The number of geometrical and optical isomers for the complex $[Rh(en)_2Cl_2]^+$ is

(A) 2

(B) 3

(C) 4

(D) 5

24. The number of Ir – Ir bond present in $Ir_4(CO)_{12}$ is

(A) six

(B) three

(C) four

(D) two

25. The nuclear reaction

$$^{7}_{3}Li + ^{2}_{1}H \rightarrow \left(^{9}_{4}Be^{*}\right) \rightarrow ^{8}_{4}Be + ^{1}_{0}n$$

is referred as

(A) Chain reaction

(B) Spallation reaction

(C) Transmutation reaction

(D) Fission reaction

26. Correct name of $Sn_2(CH_3)_6$ is

(A) Hexamethyl distanane

(B) Hexamethyl distinnane

(C) Ditin hexamethyl

(D) Distanane hexamethyl

27. Beryllium oxide has structure similar to

(A) Fluorite

(B) Wurtzite

(C) Antifluorite

(D) Sodium chloride

28. The solubility of the sulphates decreases in the order:

(A) $BeSO_4 > MgSO_4 > BaSO_4 > CaSO_4$

(B) $CaSO_4 > BaSO_4 > MgSO_4 > BeSO_4$

(C) $BaSO_4 > CaSO_4 > MgSO_4 > BeSO_4$

(D) $BeSO_4 > MgSO_4 > CaSO_4 > BaSO_4$

29. ^{31}P resonance in H_3PO_3 and H_3PO_2 consists of

(A) doublet, doublet

(B) triplet, triplet

(C) doublet, triplet

(D) triplet, doublet

30. Crystals of sodium chloride turn yellow when heated in presence of sodium vapor due to the formation of

(A) Schottky defect

(B) Frenkel defect

(C) F-centres

(D) H-centres

31. Which of the following is *NOT* an example of covalent hydride?

(A) SiH_4

(B) BaH_2

(C) H_2Te

(D) PH_3

32. The volatile nature of XeF_2, XeF_4 and XeF_6 decreases as

(A) $XeF_2 > XeF_4 > XeF_6$

(B) $XeF_6 > XeF_2 > XeF_4$

(C) $XeF_6 > XeF_4 > XeF_2$

(D) $XeF_4 > XeF_2 > XeF_6$

33. Which of the following statements is incorrect?

(A) Crown ethers can act as the host for different metal ions.

(B) Inverse crown ethers can act as the hosts for different type of anions.

(C) Crown ethers contains NO ether linkage.

(D) Inverse crown ethers act as the Lewis acids.

34. In TGA, T_i and T_f temperatures depend on

(A) Cooling rate

(B) Mechanical property of the material

(C) Thermal expansion coefficient

(D) Atmosphere above the sample

35. In adiabatic potential energy curve for an electronic state of a molecule, the potential energy is

(A) electronic potential energy for the molecule.

(B) the potential in which the nuclei move for that electronic state.

(C) the electron-nucleus potential for the molecule.

(D) the nucleus-nucleus potential for the molecule.

36. The commutator $\left[x, \frac{d^2}{dx^2}\right]$ equals to

(A) $-2x$

(B) $-\frac{d}{dx}$

(C) $-2\frac{d}{dx}$

(D) $-x$

37. Simplest wavefunction of *i*th normal mode of vibration of a polyatomic molecule can be written as follows,

$\psi_i(n) = Ni\ e^{-(\alpha_i/2)\xi_i^2} . H_n\left(\sqrt{\alpha_i}\,\xi_i\right)$, where H_n is the Hermite polynomial of order n, N_i is normalization constant $\alpha_i = 2\pi\nu_i / h$, ξ_i is *i*th normal coordinate. This shows that all wave functions of the type $\psi_i(0)$ are bases of totally symmetric representation, because

(A) $H_0\left(\sqrt{\alpha_i}\,\xi_i\right) = 1$.

(B) $H_0\left(\sqrt{\alpha_i}\,\xi_i\right) = 1$; ξ_i^2 is symmetric.

(C) $e^{-(\alpha_i/2)\xi_i^2}$ is invariant of symmetry operations.

(D) $H_n\left(\sqrt{\alpha_i}\,\xi_i\right)$ is invariant of symmetry operations.

38. For a simple cubic crystal, X-ray diffraction shows reflections for angles θ_1 and θ_2, assigned to [101] and [111] planes respectively. The ratio $\sin(\theta_1)/\sin(\theta_2)$ is

(A) $\left(\frac{3}{2}\right)$

(B) $\sqrt{\frac{3}{2}}$

(C) $\sqrt{2/3}$

(D) $\left(\frac{2}{3}\right)$

39. NaCl and KCl crystals have interpenetrating FCC structure. But unlike NaCl, KCl shows systematic absence of diffraction spot from planes with all odd h, k, l. Which of the following is *wrong* in this regard?

(A) Structure factor $F(hkl) = 4(f_+ - f_-)$ for all odd h, k, l

(B) K^+ and Cl^- have same scattering factor.

(C) K and Cl atoms have same scattering factor.

(D) Structure factor for all even h, k, l is $F(hkl) = 4(f_+ + f_-)$

40. Consider N particles at temperature T, pressure P, in volume V, with chemical potential μ having energy E. The parameters that are kept constant for a canonical ensemble are

(A) N, V, T

(B) N, V, E

(C) N, P, T

(D) μ, V, T

41. Consider a 2-state system at thermal equilibrium with equal degeneracy where the excited state is higher in energy by 0·1eV. The ratio of population of the excited state to that of the ground state at a temperature, for which $k_BT = 0{\cdot}05$eV, is

(A) e^2

(B) $e^{-3/2}$

(C) e^{-2}

(D) e^{-1}

42. The standard enthalpy of hydrogenation of propene in the reaction

$H_2C = CH — CH_3(g) + H_2(g) \rightarrow CH_3CH_2CH_3(g)$ is -120 kJ mol^{-1}.

The standard enthalpy of the oxidation of propane in the reaction

$CH_3CH_2CH_3(g) + 5O_2(g) \rightarrow 3CO_2(g) + 4H_2O(l)$

is -2220 kJ mol^{-1}.

Given standard enthalpy of formation of water

$H_2(g) + \frac{1}{2} O_2(g) \rightarrow H_2O(l)$, is -290 kJ mol^{-1}.

What is the standard enthalpy of the combustion reaction of propene?

(A) -2630 kJ mol^{-1}

(B) -2050 kJ mol^{-1}

(C) -2340 kJ mol^{-1}

(D) -1930 kJ mol^{-1}

43. For the process H_2O (l) (1 bar, 373K) $\rightarrow$ H_2O (g) (1bar, 373K) the correct set of thermodynamic parameters is

(A) $\Delta G = 0, \Delta S < 0$

(B) $\Delta G > 0, \Delta S = 0$

(C) $\Delta G < 0, \Delta S > 0$

(D) $\Delta G = 0, \Delta S > 0$

44. Increase in disorder is more, if

(A) heat is absorbed reversibly at higher temperature.

(B) heat is absorbed irreversibly at higher temperature.

(C) heat is absorbed irreversibly at lower temperature.

(D) heat is absorbed reversibly at lower temperature.

45. For a two component system, the total number of degrees of freedom at constant pressure will be

(A) 1 – P

(B) 2 – P

(C) 3 – P

(D) 4 – P

46. In a reversible reaction

$$A \rightleftharpoons B$$

which is first order in both directions, if the forward rate constant is 1.5 times of that of the backward rate constant, the amount of B produced after a long time starting with 1mol of A is

(A) 0·8 mol

(B) 1·0 mol

(C) 0·4 mol

(D) 0·6 mol

47. For a unimolecular reaction, the Lindemann rate law at low pressures become

(A) First order

(B) Second order

(C) Third order

(D) Zeroth order

48. The work done to compress an ideal gas that occupies 1·0 dm^3 at 1·0 bar isothermally first to a volume of 0·6 dm^3 at a constant pressure of 3 bar and then to a volume of 0·5 dm^3 at a constant pressure of 4 bar, is

(A) 1·6 dm^3 bar

(B) 2·0 dm^3 bar

(C) 0·8 dm^3 bar

(D) 3·2 dm^3 bar

49. $C_4\,(z)\ \sigma\,(xz) \neq \sigma\,(xz)\ C_4\,(z)$, because

(A) $C_4\,(z)$ transforms coordinates of the general point in *xy* cartesian plane and $\sigma(xz)$ transforms along *y* axis.

(B) $C_4\,(z)$ and $\sigma\,(xz)$ are commutative to each other.

(C) $\sigma\,(xz)$ plane coincides or parallel to the *xz* cartesian plane.

(D) $C_4(z)$ contains *z* axis of cartesian coordinate system.

50. Symmetry representation (Γ) of normal modes of vibration of CO_3^{-2} ions (D_{3h}) belongs to

$$\Gamma = A_1' + 2E' + A_2''$$

How many fundamental vibrational peaks are expected?

(A) 4

(B) 3

(C) 5

(D) 6

51. The character table of a certain point group is shown below:

	E	C_2	i	σ_h
Γ_1	1	1	1	1
Γ_2	1	–1	1	–1
Γ_3	1	1	–1	–1
Γ_4	1	–1	–1	1

Identify an irreducible representation from the following:

(A) Γ_1

(B) Γ_2

(C) Γ_3

(D) Γ_4

52. If nitrogen atom of ammonia is pressed down to the equilateral triangular plane formed by three hydrogen atoms, the point group is transformed from

(A) C_{3v} to C_{3h}

(B) D_{3d} to D_{3h}

(C) C_{3v} to D_{3d}

(D) C_{3v} to D_{3h}

53. In a diatomic molecule, the allowed electronic transitions are

(i) $^1\Sigma_g^+ \longrightarrow {}^3\Sigma_g^+$ (ii) $^1\Sigma_u^+ \longrightarrow {}^1\Sigma_g^+$

(iii) $^1\Delta_u \longrightarrow {}^1\Sigma_g^+$ (iv) $^1\Pi_g \longrightarrow {}^1\Sigma_u^+$

(A) (i) and (ii)

(B) (ii) and (iv)

(C) (ii) and (iii)

(D) (iii) and (iv)

54. The vibrational spectrum of HF appears at 845 cm^{-1} in the infrared. When hydrogen atom is substituted by deuterium, the spectrum is likely to appear at

(A) 835 cm^{-1}

(B) 423 cm^{-1}

(C) 599 cm^{-1}

(D) 990 cm^{-1}

55. The chemical shift of the proton in CH_3Br is 162 Hz in a 60 MHz NMR spectrometer. In another spectrometer the shift is 270 Hz. The operating frequency of the second spectrometer is

(A) 200 MHz

(B) 100 MHz

(C) 90 MHz

(D) 400 MHz

56. A swimmer enters a relatively darker world as he dives to greater depths in a swimming pool. Given that the mean molar absorption coefficient of pool water in the visible region is $6{\cdot}2 \times 10^{-5}$ $dm^3\ mol^{-1}\ cm^{-1}$, what is the approximate depth at which the diver will experience half the surface intensity of light? (density of water = 1g cm^{-3})

(A) 87·4 cm

(B) 80·7 cm

(C) 2·05 m

(D) 70·5 cm

57. $N_2O_4\ (g) \rightleftharpoons 2NO_2\ (g)$

At 27°C and 1 atm. pressure, 20% of N_2O_4 is dissociated. The K_p value is

(A) 2·0

(B) 0·05

(C) 0·25

(D) 0·16

58. The addition polymerization of M (monomer) involves the following steps (I : initiator; R : free radical)

$$I \xrightarrow{k_1} R \quad \text{(initiation)}$$

$$R + M \xrightarrow{k_2} RM$$

$$RM + M \longrightarrow RM_2 \text{ ... ... etc.}$$

$$RM_n + RM_n \xrightarrow{k_3} R - M_n - M_n - R$$

The rate constant for free radical formation is $2\times10^{-3}\ S^{-1}$. The initial concentration of the initiator is 10^{-3} mol. dm^{-3}. Assuming steady state approximation for the free radical, the kinetic chain lenght is

(A) 2×10^3

(B) 8×10^9

(C) 20

(D) 2×10^2

59. In an enzyme (E) inhibition reaction by a certain drug (inhibitor) molecule, following Lineweaver and Burk equation is found to follow:

$\frac{1}{v} = \left(1 + \frac{[I]}{K_{ESI}}\right) + \frac{k_m}{V} \cdot \frac{1}{[S]}$, where v and V are rates of reaction at low and high substrate concentration (conc.) respectively; k_m, K_{ESI}, [I] and [S] are Michaelis const., dissociation const. of ESI, inhibitor conc. and substrate conc. Select the correct mechanism of reaction from the following:

(A) The drug molecules attach to the sites of E, normally occupied by substrates.

(B) The drug molecules occupy different sites of E.

(C) The drug molecules do not occupy free sites of E but only attach with ES complexes.

(D) The drug molecules may occupy different sites of E and also attach with ES complexes.

60. Rayleigh-Ritz variational principle and second-order Rayleigh-Schrödinger perturbation theory, when applied to find approximate energy of the ground state, gives respectively

(A) upper bound to the true ground state energy and an energy, corrected to the energy of zeroth-order wavefunction.

(B) lower bound to the true ground state energy and an energy, corrected to the energy of zeroth-order wavefunction.

(C) upper bound to the true ground state energy and lower bound to the true ground state energy.

(D) lower bound to the true ground state energy and upper bound to the true ground state energy.

61. For the adsorption of a gas A on a solid surface, if k_f and k_b are the forward and backward rate constants, respectively and the surface coverage is θ, we can write according to Langmuir adsorption model

(A) $\theta = 1 - \dfrac{k_b}{k_f [A]}$

(B) $\dfrac{1}{\theta} = 1 - \dfrac{k_b}{k_f [A]}$

(C) $\theta = 1 + \dfrac{1}{\dfrac{k_f}{k_b}[A]}$

(D) $\dfrac{1}{\theta} = 1 + \dfrac{1}{\dfrac{k_f}{k_b}[A]}$

62. The rotational degeneracy of a spherical top molecules is

(A) J (J + 1)

(B) 2J (2J + 1)

(C) $(2J + 1)^2$

(D) (J + 1) (2J + 1)

63. A radioactive element has a half-life of 3×10^{13} S. The decay constant of the element is

(A) $4{\cdot}62 \times 10^{13}\ S^{-1}$

(B) $4{\cdot}62 \times 10^{-13}\ S^{-1}$

(C) $2{\cdot}31 \times 10^{-14}\ S^{-1}$

(D) $2{\cdot}31 \times 10^{14}\ S^{-1}$

64. The dissociation constants of two weak acids are K_1 and K_2. The relative strength of the two acids is given by

(A) K_1/K_2

(B) $\dfrac{K_1 + \sqrt{K_2}}{K_2 + \sqrt{K_1}}$

(C) $\left(\dfrac{K_1}{K_2}\right)^{1/2}$

(D) $\left(\dfrac{K_1}{K_2}\right)^{3/2}$

65. For any molecule (C_{3V} Symmetry), the selection rule implies that Infrared and Raman active fundamentals of the molecule can be predicted from the corresponding character table.

C_{3V}	E	$2C_3$	$3\sigma_V$		
A_1	1	1	1	Z	x^2+y^2, z^2
A_2	1	1	–1	R_Z	
E	2	–1	0	(x, y) (R_x, R_y)	($x^2 - y^2$, xy) (xz, yz)

Identify the correct statement from the following:

(A) Only Raman active — A_1 and A_2

(B) Only Infrared active — E and A_1

(C) Both Infrared and Raman active — A_2 and E

(D) Both Infrared and Raman active — A_1 and E

66. For an ideal solution, the correct statement is

(A) $\Delta_{mix} H = 0$, $\Delta_{mix} V = 0$ and $\Delta_{mix} S = 0$

(B) $\Delta_{mix} H = 0$, $\Delta_{mix} V = 0$ and $\Delta_{mix} S \neq 0$

(C) $\Delta_{mix} H \neq 0$, $\Delta_{mix} V \neq 0$ and $\Delta_{mix} S = 0$

(D) $\Delta_{mix} H \neq 0$, $\Delta_{mix} V = 0$ and $\Delta_{mix} S \neq 0$

67. The fraction of rigid rotators in the *j*th rotational level is given by (where q_{rot} is the rotational partition function)

(A) $\dfrac{(2J+1)e^{-\hbar^2 J(J+1)/(2Ik_BT)}}{q_{rot}}$

(B) $\dfrac{e^{-\hbar^2 J(J+1)/(2Ik_BT)}}{q_{rot}}$

(C) $\dfrac{2J\, e^{-\hbar^2 J(J+1)/(2Ik_BT)}}{q_{rot}}$

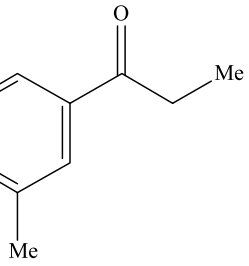
(D) $\dfrac{J(J+I)\, e^{-\hbar^2 J(J+1)/(2Ik_BT)}}{q_{rot}}$

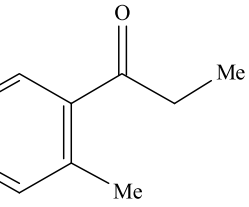
68. An organic compound with molecular formula $C_{10}H_{12}O$ exhibits the following spectral data:

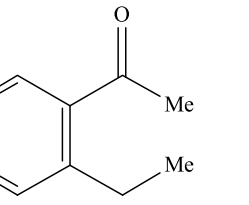
IR(cm^{-1}): 1690 cm^{-1}

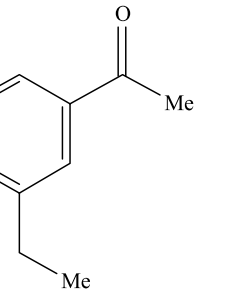
^1H NMR ($CDCl_3$): δ 1·30 (t, 3H), 2·41 (q, 2H), 2·32 (s, 3H), 7·44 (t, 1H), 7·57 (dt, 1H), 7·77 (t, 1H), 7·90 (dt, 1H)

The structure of the compound is

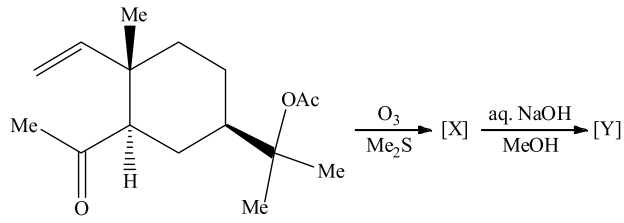
(A) 

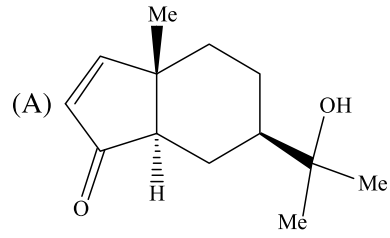
(B) 

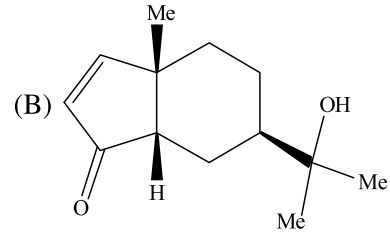
(C) 

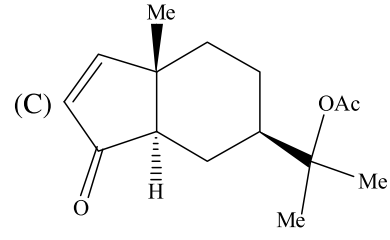
(D) 

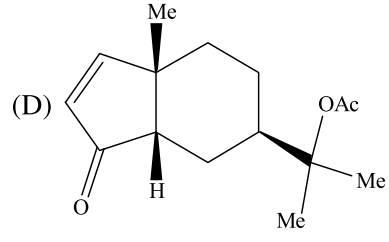
69. The structure of compound [Y] in the following reaction sequence is



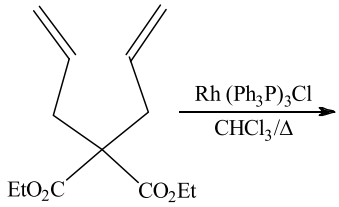
(A) 

(B) 

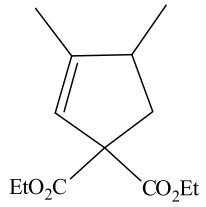
(C) 

(D) 

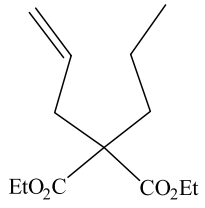
70. The major product formed in the following reaction is



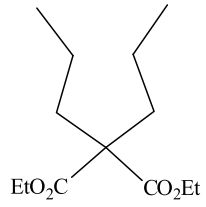
(A)



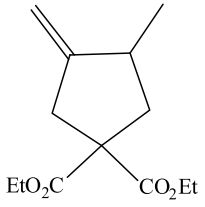
(B)



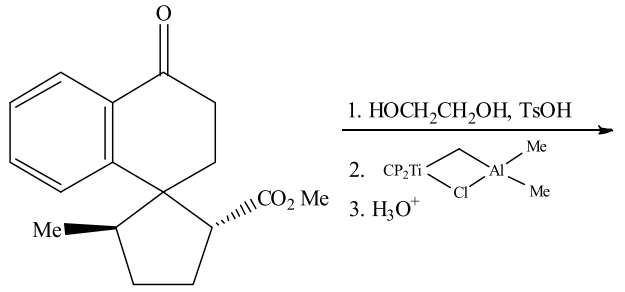
(C)



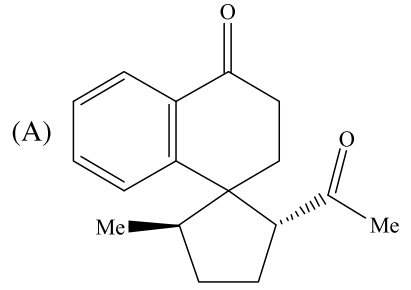
(D)



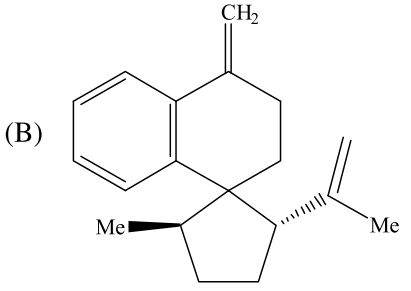
71. The product formed in the following reaction sequences is:



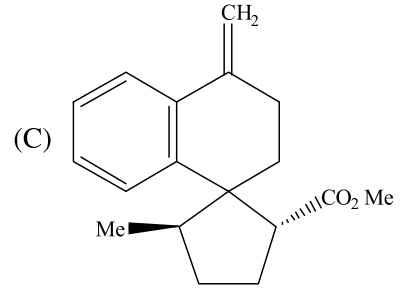
(A)



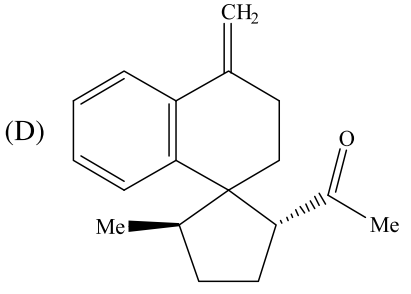
(B)



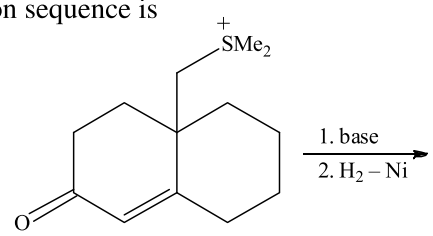
(C)

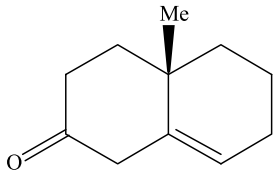


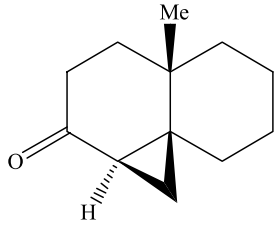
(D)

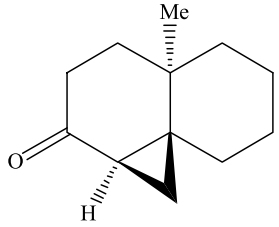


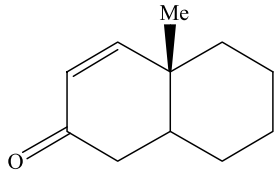
72. The major product formed in the following reaction sequence is



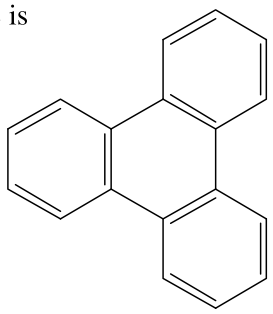
(A)


(B)


(C)


(D)


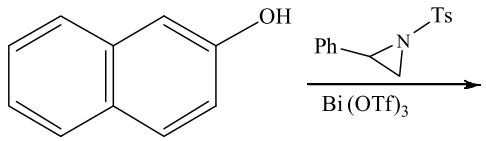
73. The point group symmetry of the following molecule is

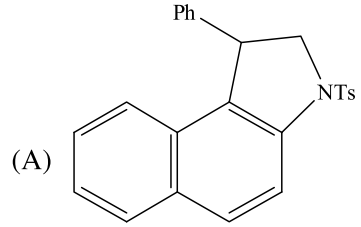


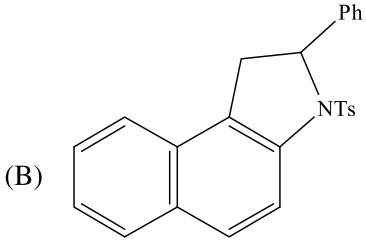
(A) D_{6h} (B) C_{3v}

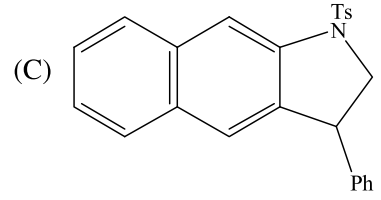
(C) C_{3h} (D) D_{3h}

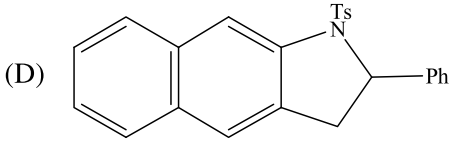
74. The major product formed in the following reaction is:



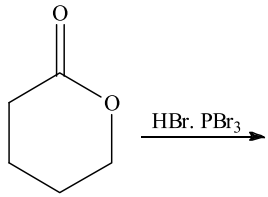
(A)


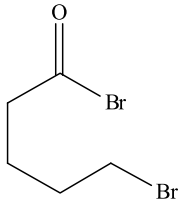
(B)


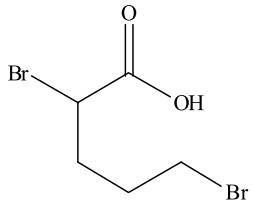
(C)


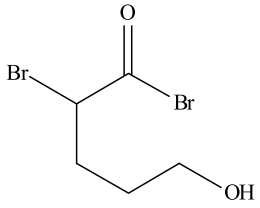
(D)


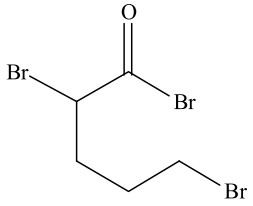
75. The major outcome of the following reaction is



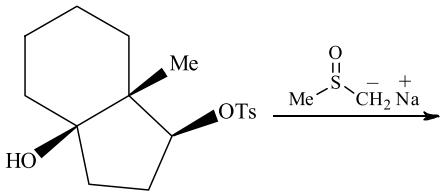
(A)


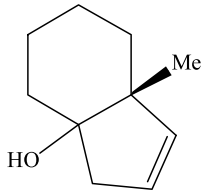
(B)


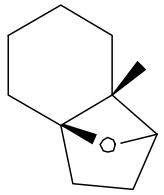
(C)


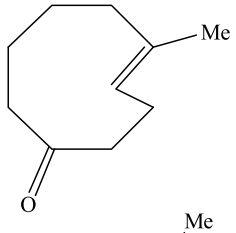
(D)


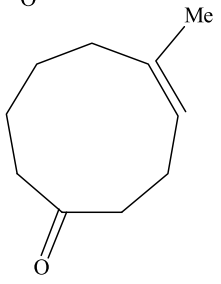
76. The major product formed in the following reaction is



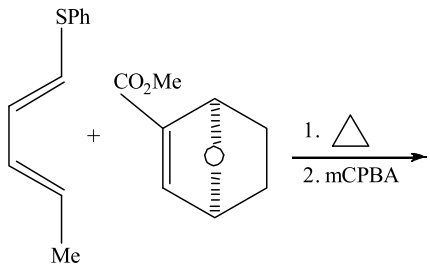
(A)


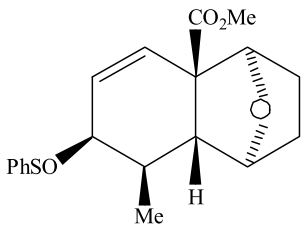
(B)


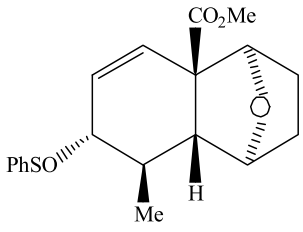
(C)


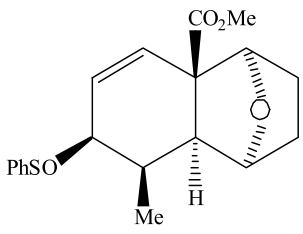
(D)


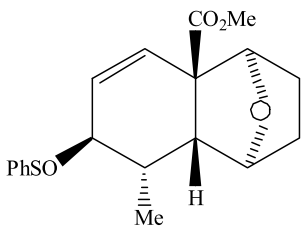
77. The major product with correct stereochemistry in the following reaction sequence is



(A)


(B)


(C)


(D)


78. An organic compound [X] ($C_{13}H_{18}O_3$) exhibits the following spectral data:

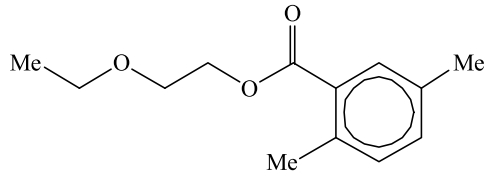
IR (cm^{-1}): 1720

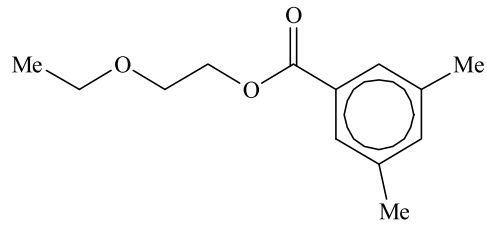
^1H NMR ($CDCl_3$): δ 0·90 (t, 3H), 2·35 (s, 6H), 3·21 (q, 2H), 3·82 (t, 2H), 4·41 (t, 2H), 7·07 (s, 1H), 7·58 (s, 2H)

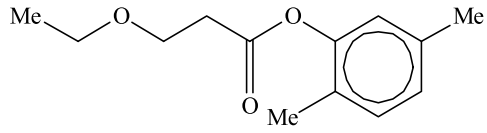
The compound [X] with an excess of MeMgBr gives a 1 : 1 mixture of compounds [Y] and [Z]. The compound [Z] exhibits the following ^1H NMR data:

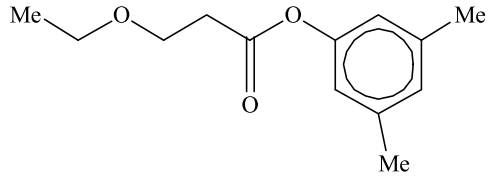
^1H NMR ($CDCl_3$): δ 0·90 (t, 3H) 2·0 (bs, 1H), 3·21 (q, 2H), 3·56 (t, 2H), 3·70 (t, 2H)

The compound [X] is

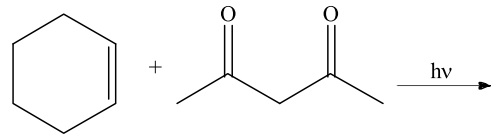
(A)


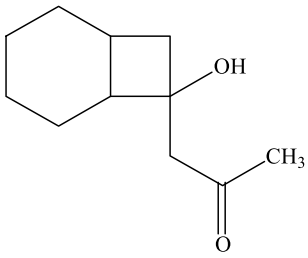
(B)


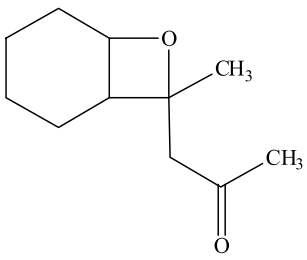
(C)


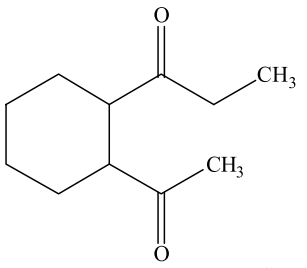
(D)


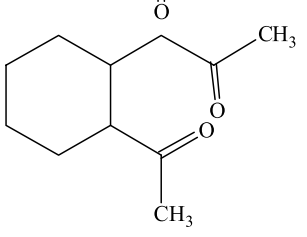
79. The major product formed in the following photochemical reaction is



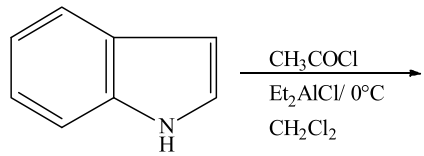
(A)


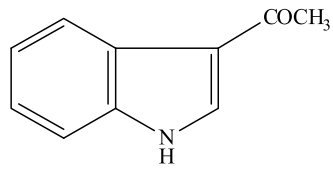
(B)


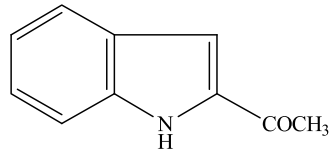
(C)


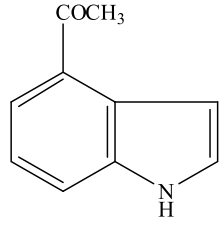
(D)


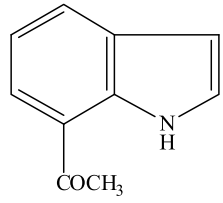
80. The correct product formed in the following reaction is



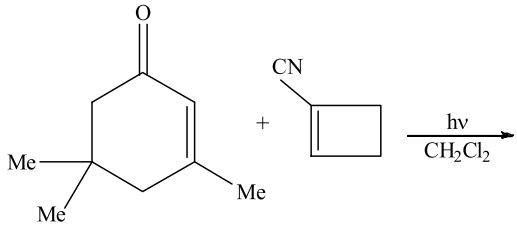
(A)


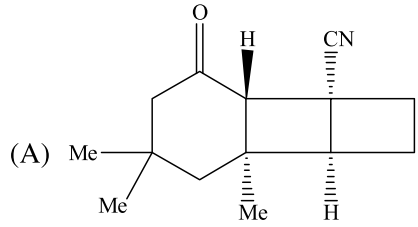
(B)


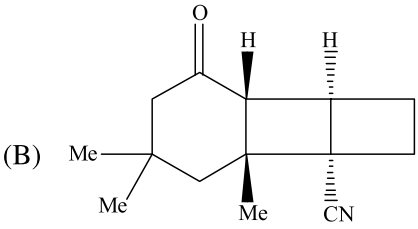
(C)


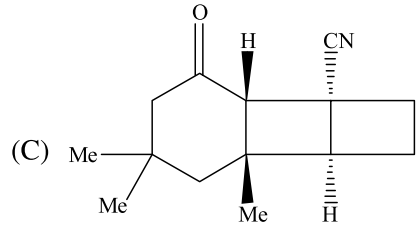
(D)


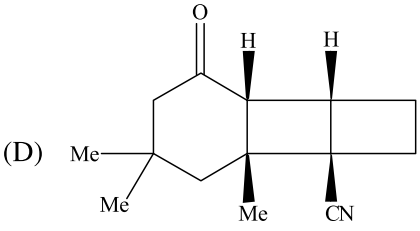
81. The major outcome of the following photochemical reaction is



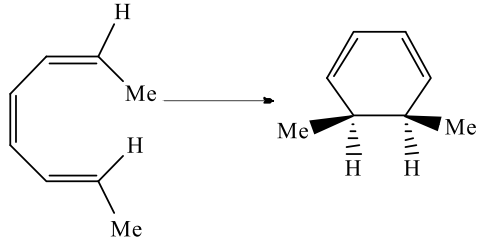
(A)


(B)


(C)


(D)


82. The following electrocyclic ring closure reaction involves

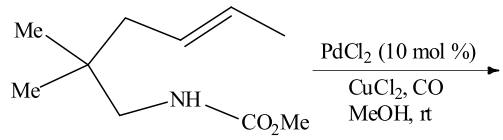


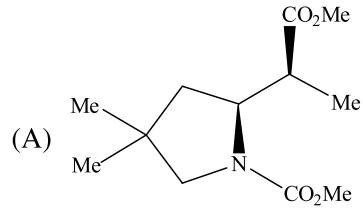
(A) Photochemical disrotatory path
(B) Thermal conrotatory path
(C) Photochemical conrotatory path
(D) Thermal disrotatory path

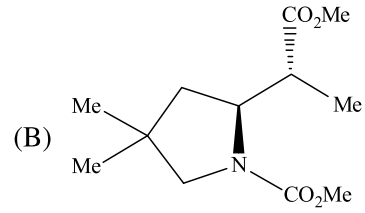
83. 18–Crown–6 binds ammonium ion involving

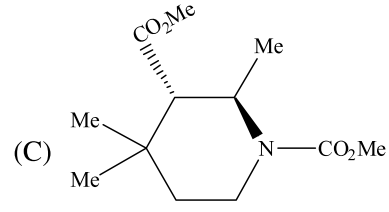
(A) ion-dipole and hydrogen bonding interactions.
(B) ion-dipole interaction.
(C) hydrogen bonding interaction.
(D) charge-charge and hydrogen bonding interactions.

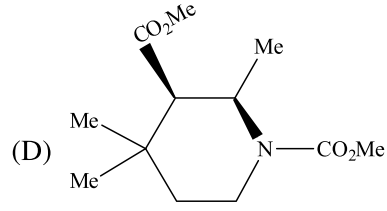
84. The following intramolecular aminopalladation gives the major product



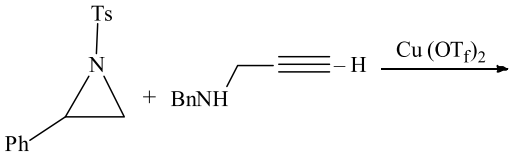
(A)


(B)


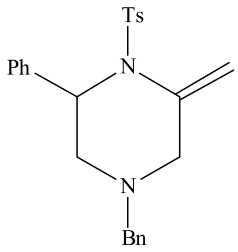
(C)


(D)


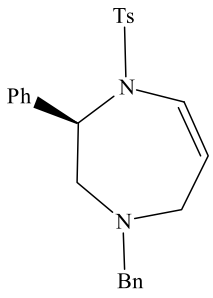
85. The major product formed in the following reaction is



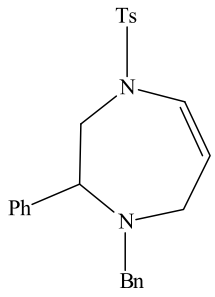
(A)



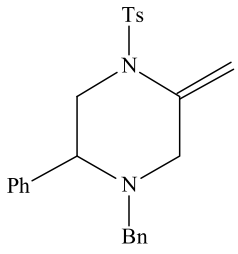
(B)



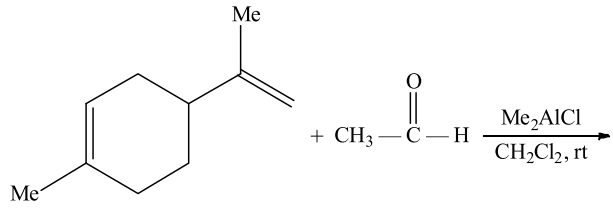
(C)



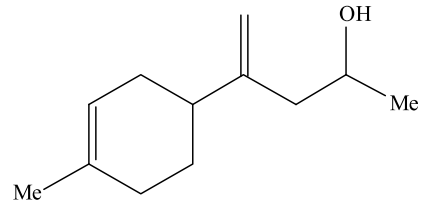
(D)



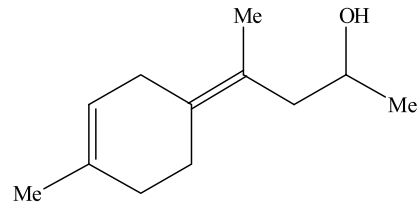
86. The major product formed in the following reaction is



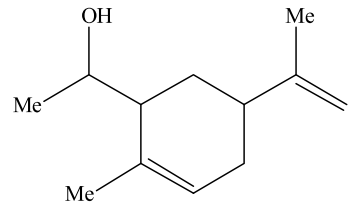
(A)



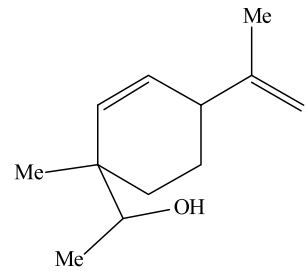
(B)



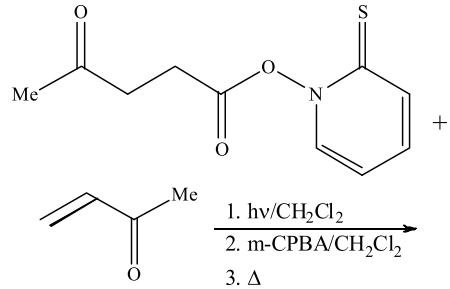
(C)

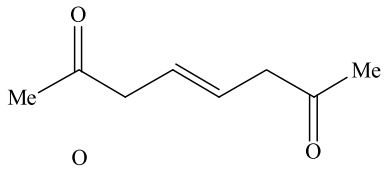


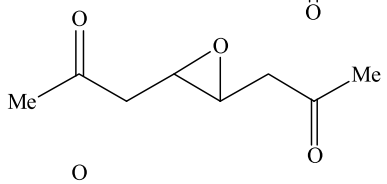
(D)

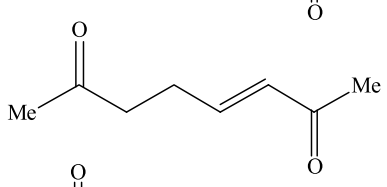


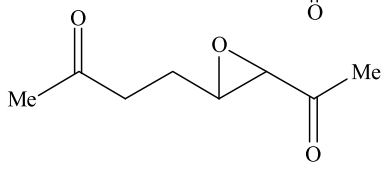
87. The following reaction sequence produce the major product



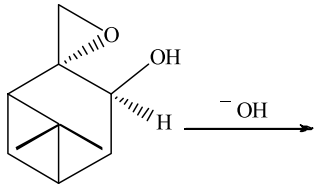
(A) 

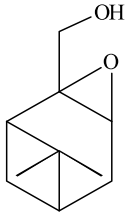
(B) 

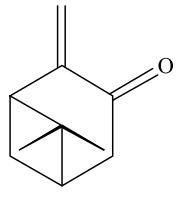
(C) 

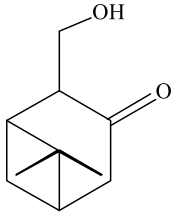
(D) 

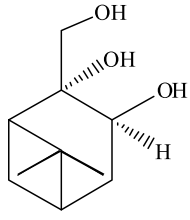
88. The major outcome of the following reaction is



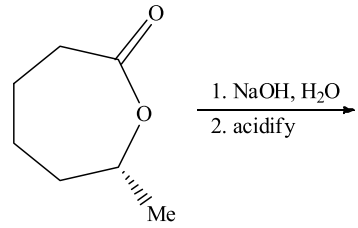
(A) 

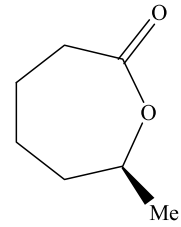
(B) 

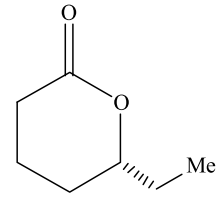
(C) 

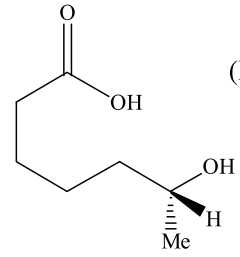
(D) 

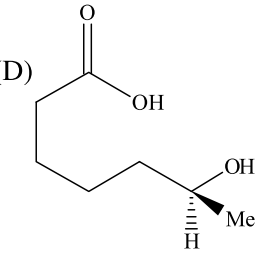
89. The major product formed in the following reaction is



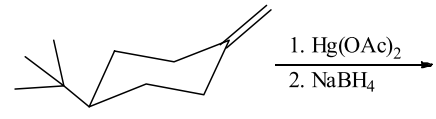
(A) 

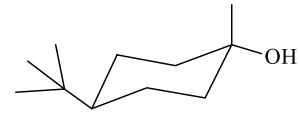
(B) 

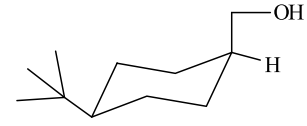
(C) 

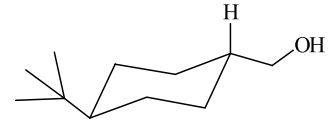
(D) 

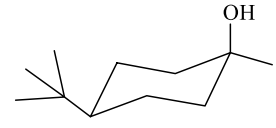
90. The major product formed in the following reaction is



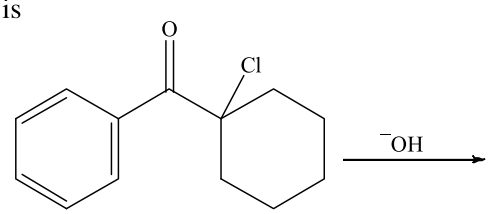
(A) 

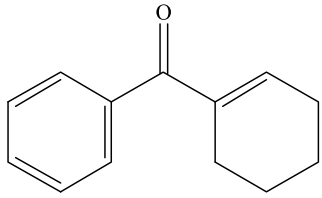
(B) 

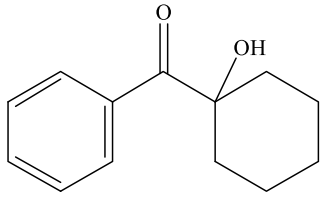
(C) 

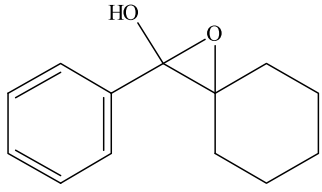
(D) 

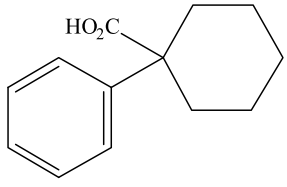
91. The major product formed in the following reaction is



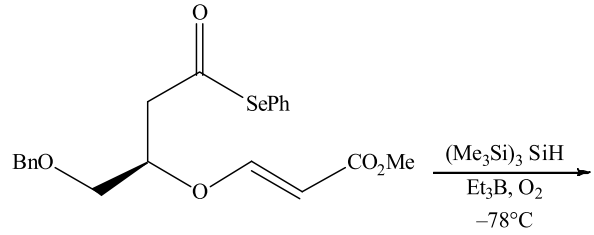
(A)


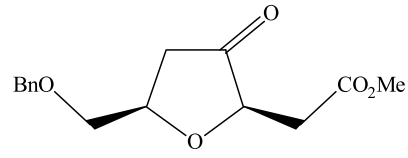
(B)


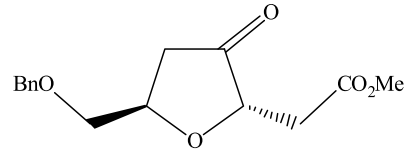
(C)


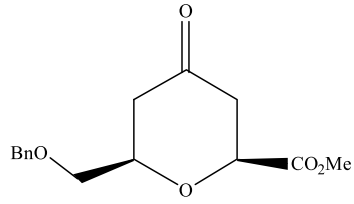
(D)


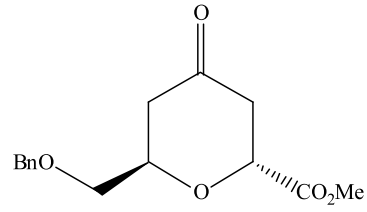
92. The major product accomplished in the following reaction is



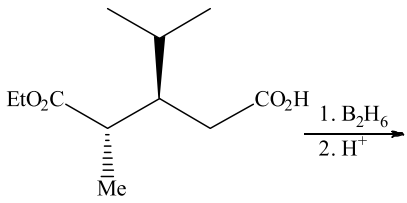
(A)


(B)


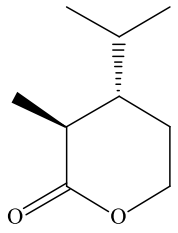
(C)


(D)


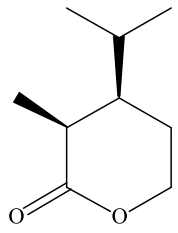
93. The major product formed in the following reaction is:



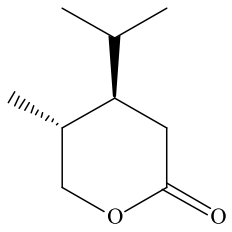
(A)



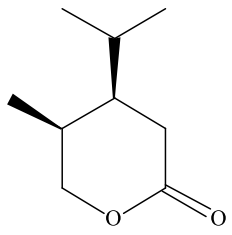
(B)



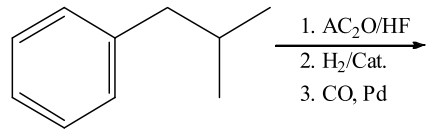
(C)



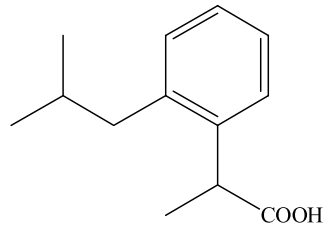
(D)



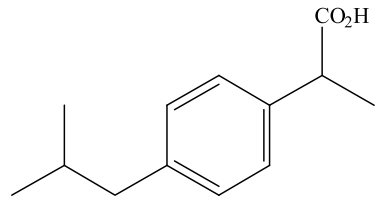
94. The major product formed in the following reaction sequence is:



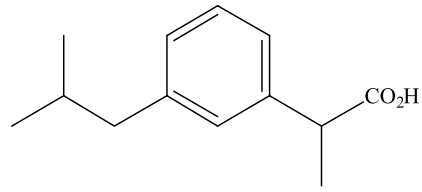
(A)



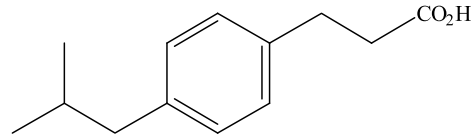
(B)



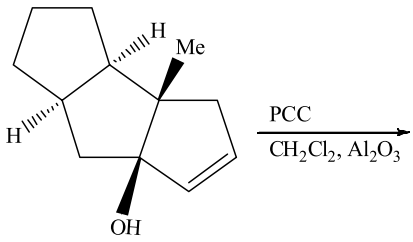
(C)

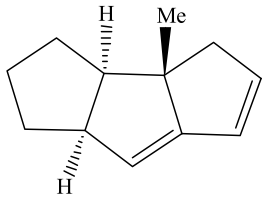


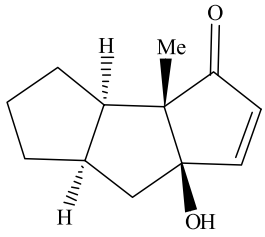
(D)

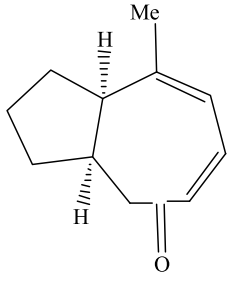


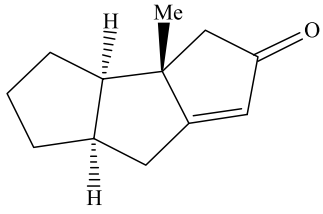
95. The following reaction produces the major product



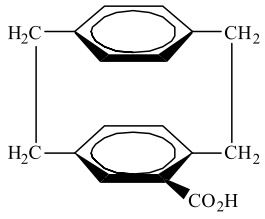
(A) 

(B) 

(C) 

(D) 

96. The following molecule is chiral owing to the presence of



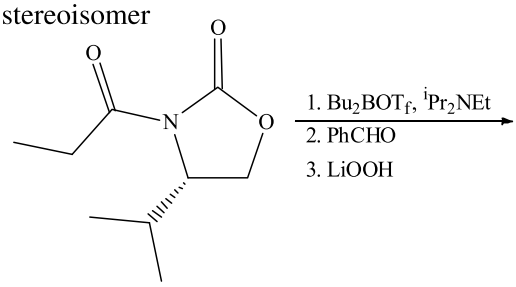
(A) Chiral axis

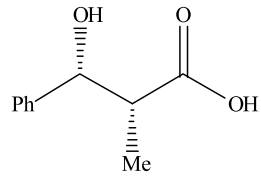
(B) Chiral centre

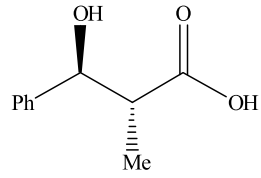
(C) Chiral plane

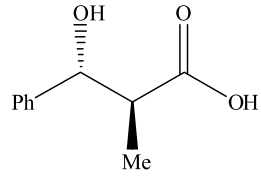
(D) Helicity

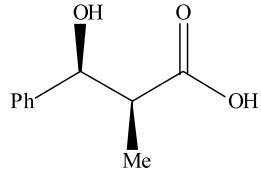
97. The following reaction sequences produce the major stereoisomer



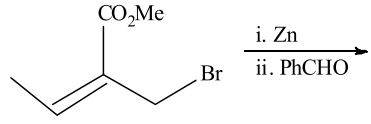
(A) 

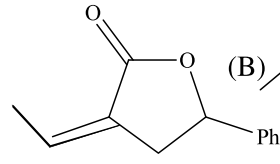
(B) 

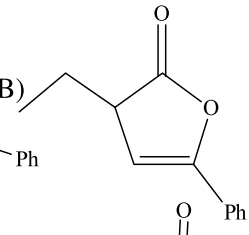
(C) 

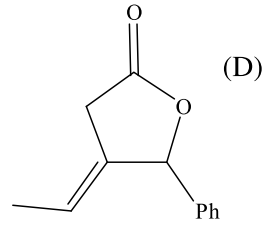
(D) 

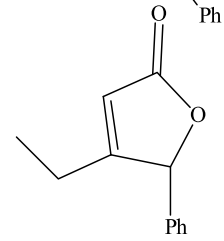
98. The correct structure of the product in the following reaction sequence is



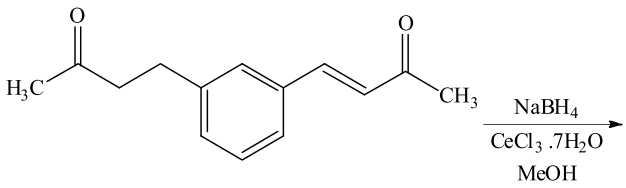
(A) 

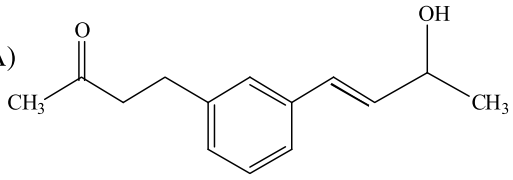
(B) 

(C) 

(D) 

99. The major product formed in the following reaction is



(A)


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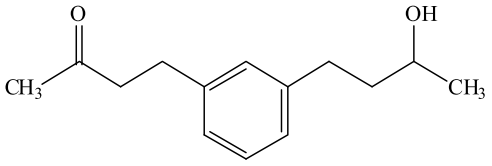
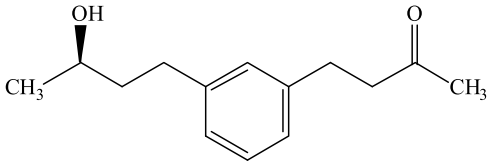
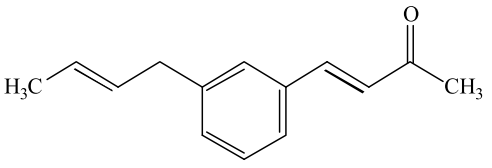
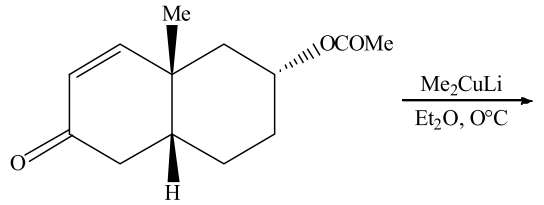
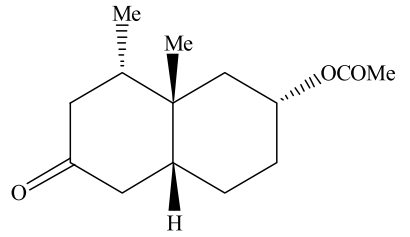


(C)


(D)


100. The major product of the reaction is



(A)


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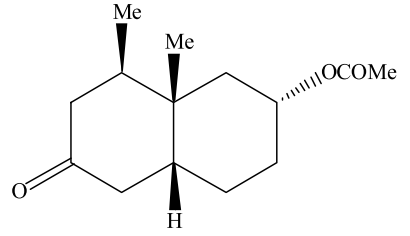
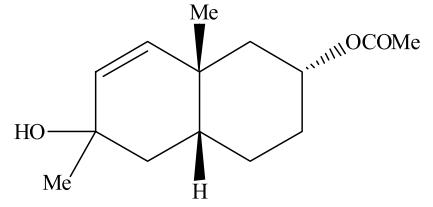
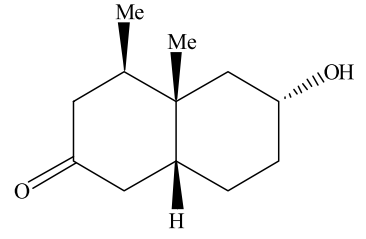


(C)


(D)


Space for Rough Work

Space for Rough Work

Space for Rough Work

Space for Rough Work

Space for Rough Work