DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE TOLD TO DO SO

T.B.C. : ESGC-B-CMT

Test Booklet Series

A

Serial 1004565

Combined Geo-Scientist (P) Examination-2025

TEST BOOKLET

Paper-II

CHEMISTRY

Time Allowed : Two Hours *Maximum Marks : 300*

INSTRUCTIONS

1. IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS TEST BOOKLET ***DOES NOT*** HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR ITEMS, ETC. IF SO, GET IT REPLACED BY A COMPLETE TEST BOOKLET.
2. **Please note that it is the candidate's responsibility to encode and fill in the Roll Number and Test Booklet Series Code A, B, C or D carefully and without any omission or discrepancy at the appropriate places in the OMR Answer Sheet. Any omission/discrepancy will render the Answer Sheet liable for rejection.**
3. You have to enter your Roll Number on the Test Booklet in the Box provided alongside. ***DO NOT*** write ***anything else*** on the Test Booklet.
4. This Test Booklet contains **120** items (questions). Each item comprises four responses (answers). You will select the response which you want to mark on the Answer Sheet. In case you feel that there is more than one correct response, mark the response which you consider the best. In any case, choose ***ONLY ONE*** response for each item.
5. You have to mark all your responses ***ONLY*** on the separate Answer Sheet provided. See directions in the Answer Sheet.
6. All items carry equal marks.
7. Before you proceed to mark in the Answer Sheet the response to various items in the Test Booklet, you have to fill in some particulars in the Answer Sheet as per instructions sent to you with your Admission Certificate.
8. After you have completed filling in all your responses on the Answer Sheet and the examination has concluded, you should hand over to the Invigilator ***only the Answer Sheet***. You are permitted to take away with you the Test Booklet.
9. Sheets for rough work are appended in the Test Booklet at the end.
10. **Penalty for wrong answers :**

THERE WILL BE PENALTY FOR WRONG ANSWERS MARKED BY A CANDIDATE.

(i) There are four alternatives for the answer to every question. For each question for which a wrong answer has been given by the candidate, **one-third** of the marks assigned to that question will be deducted as penalty.

(ii) If a candidate gives more than one answer, it will be treated as a **wrong answer** even if one of the given answers happens to be correct and there will be same penalty as above to that question.

(iii) If a question is left blank, i.e., no answer is given by the candidate, there will be **no penalty** for that question.

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1. Which one of the following statements regarding hydrogen atom and other one electron species is correct ?
   (a) For H-atom, s orbital is dependent on the radial wave function (r) only and independent of the angular wave function (θ and ϕ).
   (b) For H-atom, s orbital is dependent on both the radial wave function (r) and the angular wave function (θ and ϕ).
   (c) For H-atom, there is no such dependence observed for s orbital; rather, the dependence starts with involvement of p orbital.
   (d) For H-atom, s orbital is dependent on the angular wave function (θ and ϕ) only and independent of the radial wave function (r).

2. The correct order of penetrating ability of atomic orbitals is :
   (a) 4s > 4p > 4d > 4f
   (b) 4f > 4d > 4p > 4s
   (c) 4p > 4s > 4d > 4f
   (d) 4d > 4p > 4s > 4f

3. The correct electronic configuration of Platinum is :
   (a) [Xe] $4f^{14}\ 5d^{10}\ 6s^{0}$
   (b) [Xe] $4f^{14}\ 5d^{9}\ 6s^{1}$
   (c) [Xe] $4f^{14}\ 5d^{8}\ 6s^{2}$
   (d) [Xe] $4f^{13}\ 5d^{10}\ 6s^{1}$

4. The element with the highest enthalpy of atomization in the first transition series is :
   (a) V
   (b) Fe
   (c) Mn
   (d) Cu

5. An element forms an ion in the +IV oxidation state with electronic configuration : [Xe] $4f^{14}\ 5d^{10}$. Which group and period of the Modern Periodic Table does the element belong to ?
   (a) p-block element from Period – 6 and Group – 14
   (b) d-block element from Period – 6 and Group – 10
   (c) p-block element from Period – 5 and Group – 13
   (d) d-block element from Period – 5 and Group – 12

6. The metallic elements of this group of the periodic table show the highest oxidation state of (+VI) at the bottom of the group and a stable oxidation state of (+III) at the top of the group. The group to which the elements belong in the Modern Periodic Table is :
   (a) Group 16
   (b) Group 15
   (c) Group 6
   (d) Group 13

7. The S^{2-} ions prefer to bind to the :
   (a) Alkali metal ions
   (b) Alkaline earth ions
   (c) Lighter transition metal ions in high oxidation states
   (d) Heavier transition metal ions in low oxidation states

8. Which of the following statements are correct ?

1. The ionic radii of a metal ion in a given oxidation state are always a constant.
2. If a metal can form cations of different oxidation states, then for a given coordination number its ionic radius increases with increasing oxidation state.
3. If a metal can form cations of different oxidation states, then for a given coordination number its ionic radius decreases with increasing oxidation state.
4. The ionic radii of a metal ion in a given oxidation state increase with an increase in coordination number.

Select the answer using the code given below :

(a) 1 and 2
(b) 2 and 4
(c) 3 and 4
(d) 1 and 3

9. The effective nuclear charge on the 4s electron of Vanadium atom is :

(a) 4.30
(b) 3.30
(c) 1.95
(d) 5.20

10. The element with the highest value of electronegativity in the 5d series is :

(a) W
(b) Hg
(c) Au
(d) Os

11. Which one of the following represents the correct order of electron gain enthalpy of halogen atoms ?

(a) F > Cl > Br > I
(b) I > Br > Cl > F
(c) I > Cl > Br > F
(d) Cl > F > Br > I

12. Which one among the following elements shows the maximum ferromagnetism ?

(a) Sn
(b) Xe
(c) Sr
(d) Gd

13. The redox chemistry of silver is given by the following equations :

1. $Ag^+(aq) + e^- \rightarrow Ag(s)$ $E^\circ = +0.80$
2. $Ag^{2+}(aq) + e^- \rightarrow Ag^+(aq)$ $E^\circ = +1.98$

Which of the following statements are ***not*** correct with respect to above equations ?

Statement (I) :
Reaction 1 is thermodynamically more feasible than reaction 2.

Statement (II) :
Ag^+ is a good oxidizing agent.

Statement (III) :
Reaction 2 is thermodynamically more feasible than reaction 1.

Statement (IV) :
Ag^+ is a good reducing agent.

Select the answer using the code given below :

(a) Statement (III) and (IV)
(b) Statement (I) and (II)
(c) Statement (II) and (III)
(d) Statement (I) and (IV)

14. The oxidation state of Cerium in Ceric sulphate is :

(a) Ce^{2+}
(b) Ce^{3+}
(c) Ce^{4+}
(d) Ce^{5+}

15. Hydrolysis of NO_2 forms :

(a) HNO_2
(b) HNO_3
(c) HNO_2 and HNO_3
(d) HNO_3 and NO

16. Which one of the following statements regarding $B(OH)_3$ is correct ?
(a) It is a hydroxide and a strong Brønsted base.
(b) It is a tribasic acid.
(c) It is a weak Lewis acid.
(d) It is a strong Brønsted acid.

17. The correct order of reducing nature of the oxy acids is :
(a) $H_3PO_4 > H_3PO_3 > H_3PO_2$
(b) $H_3PO_2 > H_3PO_3 > H_3PO_4$
(c) $H_3PO_3 > H_3PO_4 > H_3PO_2$
(d) $H_3PO_2 > H_3PO_4 > H_3PO_3$

18. A salt with the stoichiometry AB_2 where $r(A^{4+}) = 63$ pm and $r(B^{2-}) = 140$ pm adopts :
(a) Rutile structure
(b) Rock salt structure
(c) Fluorite structure
(d) Zinc Blende

19. In ZnS crystal lattice, S^{2-} ions form two different close-packed arrays in which Zn^{2+} occupies tetrahedral holes. Two structures adopted by ZnS will be :
(a) Zinc Blende (ccp), Wurtzrite (hcp)
(b) Zinc Blende (ccp), Wurtzrite (bcc)
(c) Zinc Blende (bcc), Wurtzrite (hcp)
(d) Zinc Blende (ccp), Wurtzrite (fcc)

20. The cations A^+ will form the most ionic halide and A^{3+} the most covalent halide with :
(a) I^- and F^- respectively
(b) F^- and I^- respectively
(c) F^- and F^- respectively
(d) I^- and I^- respectively

21. Doping NiO with Li_2O in presence of air/O_2 increases the electrical conductivity due to :
(a) Formation of F centres in the NiO lattice
(b) Formation of a Schottky defect in the NiO lattice
(c) Formation of excess holes in the NiO lattice
(d) Formation of a Frenkel defect in the NiO lattice

22. Which one of the following statements regarding ligand field theory is correct ?
(a) It considers which atomic orbitals on the metal are used for bonding and predicts the shape and stability of the complex. However, it fails to explain electronic spectra and variation of magnetic properties with temperature.
(b) It considers that bonding in coordination compounds is purely electrostatic in nature arising due to ion-ion or ion-dipole attractions which remarkably explains the electronic spectra and magnetism in transition metal complexes.
(c) It provides some allowance for the possibility of some covalent interactions between the orbitals on the metal and ligand in form of σ overlap of orbitals, π overlap of orbitals or $d\pi - p\pi$ bonding (back bonding) due to π overlap of full d orbitals on the metal and with empty p orbitals on the ligands.
(d) It provides full allowance of both covalent and ionic contributions and much of the qualitative descriptions require symmetry and group theory approaches.

23. The hybridization of boron and oxygen atoms in boric acid (H_3BO_3) are respectively :
(a) sp^3 and sp^2
(b) sp^3 and sp^3
(c) sp^2 and sp^2
(d) sp^2 and sp^3

24. How many resonating structures are possible for CO_3^{2-} ?
(a) 2
(b) 3
(c) 4
(d) 5

25. Which one of the following statements is ***not*** correct with respect to geometry and magnetism of the given complexes ?
(a) $[Ni(CN)_4]^{2-}$ is square planar and diamagnetic.
(b) $[Ni(Cl)_4]^{2-}$ is tetrahedral and paramagnetic.
(c) $[Fe(CN)_6]^{4-}$ is octahedral and diamagnetic.
(d) $Ni(CO)_4$ is tetrahedral and paramagnetic.

26. Consider the following 3-step reaction :

$[Ni(H_2O)_6]^{2+} + en \longrightarrow [Ni(en)(H_2O)_4]^{2+} + 2H_2O$

$[Ni(en)(H_2O)_4]^{2+} + en \longrightarrow [Ni(en)_2(H_2O)_2]^{2+} + 2H_2O$

$[Ni(en)_2(H_2O)_6]^{2+} + en \longrightarrow [Ni(en)_3]^{2+} + 2H_2O$

Which one of the following statements is correct for the overall balanced reaction of the above 3-step reaction ?

(a) Number of molecules on product side will be greater than the number of molecules on the substrate side indicating increase in entropy with more chelation.

(b) Number of molecules on product side will be less than the number of molecules on the substrate side indicating decrease in enthalpy with more chelation.

(c) Number of molecules on product side equals the number of molecules on the substrate side indicating no change in enthalpy and chelation.

(d) Number of molecules on product side will be greater than the number of molecules on the substrate side indicating increase in enthalpy with less chelation.

27. The IUPAC name of $[Pt(Py)_4][PtCl_4]$ is :

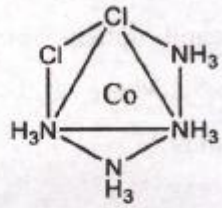
(a) Tetrapyridineplatinum(I) tetrachloroplatinate(III)

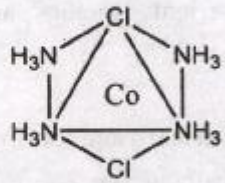
(b) Tetrapyridineplatinum(III) tetrachloroplatinate(III)

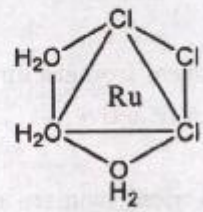
(c) Tetrachloroplatinum(II) tetrapyridineplatinate(II)

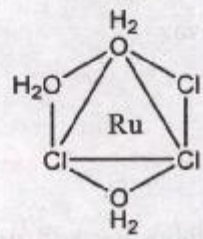
(d) Tetrapyridineplatinum(II) tetrachloroplatinate(II)

28. Consider the following structures :

1. 

2. 

3. 

4. 

Which one of the following statements is correct for the structures given above ?

(a) 1 and 2 are cis and trans tetraamminedichlorocobalt(III) and 3 and 4 are cis and trans triaquatrichlororuthenium(III) isomeric pairs.

(b) 1 and 2 are cis and trans tetraamminedichlorocobalt(III) and 3 and 4 are fac and mer triaquatrichlororuthenium(III) isomeric pairs.

(c) 1 and 2 are fac and mer tetraamminedichlorocobalt(III) and 3 and 4 are cis and trans triaquatrichlororuthenium(III) isomeric pairs.

(d) 1 and 2 are fac and mer tetraamminedichlorocobalt(III) and 3 and 4 are fac and mer triaquatrichlororuthenium(III) isomeric pairs.

29. Which one of the following statements is true for geometrical and optical isomers for a $[Ma_2b_2c_2]$ complex, where a, b and c are monodentate ligands ?

(a) Six geometrical isomers and all are optically active.

(b) Five geometrical isomers among which, one is optically active.

(c) Four geometrical isomers among which, two are optically active.

(d) Three geometrical isomers and all are optically active.

30. Which one of the following will ***not*** make an acidic buffer solution ?

(a) 100 mL 0.1 N CH_3COOH (aq) + 25 mL 0.4 N NaOH (aq)

(b) 100 mL 0.1 N CH_3COOH (aq) + 25 mL 0.3 N NaOH (aq)

(c) 100 mL 0.1 N CH_3COOH (aq) + 25 mL 0.2 N NaOH (aq)

(d) 100 mL 0.1 N CH_3COOH (aq) + 25 mL 0.1 N NaOH (aq)

31. In trialkyl amines, the 'p-character' of lone-pair of electrons on the N-atom :

(a) Increases with bulkier alkyl group resulting in superior donation of lone-pair towards an acid

(b) Decreases with bulkier alkyl group resulting in superior donation of lone-pair towards an acid

(c) Increases with bulkier alkyl group resulting in poor donation of lone-pair towards an acid

(d) Decreases with bulkier alkyl group resulting in poor donation of lone-pair towards an acid

32. Which one of the following statements regarding Ostwald's Law of Dilution is ***not*** correct ?

(a) It is only applicable to weak electrolytes at equilibrium where the dissociation constant K, can be related to degree of ionization (α) and concentration c (in m/L) as $K = \alpha^2 c (1 - \alpha)$.

(b) It is only valid for dilute solutions, where the concentration of the electrolyte is very low.

(c) It is applicable to strong as well as weak electrolytes at extreme dilution, if temperature of the solution remains constant during the dilution process.

(d) The electrolyte solution must behave ideally, which means that the interactions between the solvent and solute particles should be negligible.

33. What happens to the ionic product ($K_w = 1.0 \times 10^{-14}$) of water (1 L) at 25°C when it is added with 1 mL of 0.1 N HCl followed by 1 mL of 0.1 N NaOH ?

(a) Ionic product remains constant without any significant change

(b) Ionic product first increases with addition of HCl due to increase in H^+ and then decreases on addition of NaOH due to addition of same amount of OH^- to its original value

(c) Ionic product increases on addition of HCl $[H^+]$ and further increases due to addition of NaOH $[OH^-]$ as both factors are involved in the ionic product as $K_w = [H^+]\,[OH^-]$

(d) Ionic product of water decreases constantly as the ionization of water will decrease constantly on addition of any external electrolyte irrespective of being an acid or a base

34. Which one of the following concentrations of H^+ ions indicate an acidic pH of water at 100°C ? (where K_w at 100°C is 5.5×10^{-13})

(a) $[H^+] = 7.3 \times 10^{-7}$

(b) $[H^+] = 7.4 \times 10^{-7}$

(c) $[H^+] = 7.5 \times 10^{-7}$

(d) $[H^+] = 7.0 \times 10^{-7}$

35. What will be the pH of the solution produced by adding 20 mL of 1 M HCl to 1 L of a solution containing 0.1 M acetic acid and 0.1 M sodium acetate

($K_a = 1.75 \times 10^{-5}$ mol L^{-1}) ?

(where, log 1.75 = 0.24; log 2/3 = – 0.176)

(a) 4.58

(b) 4.93

(c) 4.76

(d) 5.06

36. A basic buffer solution is formed by mixing aqueous solutions of :

(a) A weak base and its salt

(b) A strong base and its salt

(c) A weak acid and its salt

(d) A strong acid and a strong base

37. In quantitative volumetric analysis for the iodometric determination of copper, what will be the required amount of $CuSO_4.5H_2O$ for preparing 100 mL of N/40 standard solution ?

Reactions involved are :

$$2Cu^{2+} + 4I^- \longrightarrow 2CuI + I_2$$

$$I_2 + 2S_2O_3^{2-} \longrightarrow S_4O_6^{2-} + 2I^-$$

(Molecular weight of $CuSO_4.5H_2O$ is 159.60 g/mol.)

(a) 0.19 g

(b) 0.29 g

(c) 0.39 g

(d) 0.49 g

38. Consider the following characteristics for a primary standard substance :

1. The substance has high formula weight.
2. The substance is 100% pure with very less impurity of only 0.01 to 0.02%.
3. The substance is stable indefinitely at room temperatures.
4. The substance is involved in a reaction for which equilibrium is far right to obtain a very sharp end point.

The above statements are correct for which one of the following pair of substances ?

(a) Na_2CO_3 and NaOH

(b) $C_2H_2O_4$ and $KMnO_4$

(c) $C_2H_2O_4$ and $K_2Cr_2O_7$

(d) $KHC_8H_4O_4$ and H_2SO_4

39. In order to determine the amount of Ca^{2+} through complexometric titration with EDTA using Eriochrome black T, which one of the following may be adapted to obtain a sharp end point ?

(a) A sufficiently large amount of free Mg^{2+} should be added to Ca^{2+} solution

(b) A small measured amount of free Mg^{2+} should be added to Ca^{2+} solution

(c) Addition of Mg^{2+} is not at all required as it will hinder with the formation of Ca-EDTA complex by making Mg-EDTA complex

(d) Both (a) and (b) are correct as Mg^{2+} is required to initiate the complexation reaction failing which EDTA remains unreacted

40. Consider an acid-base indicator (HIn) as a weak acid which exhibits red colour in non-ionized form and blue colour in ionized form :

$$HIn \rightleftharpoons H^+ + In^-$$
(red) (blue)

What is the general transition range in terms of pH units between the colours of an indicator according to the equation $pH = pK_{In} + \log [In^-]/[HIn]$, provided that your eyes discern one colour only when it is 10 times as intense as the other ?

(a) 1
(b) 2
(c) 3
(d) 4

41. Consider the following statements regarding gas molecules :

Statement 1 : Heavier gas molecules move more slowly than light gas molecules.

Statement 2 : The average kinetic energy of gas molecules is independent of the mass.

Which one of the following is correct in respect of above statements ?

(a) Both statement 1 and statement 2 are true and statement 2 is the correct explanation of statement 1.
(b) Both statement 1 and statement 2 are true but statement 2 is ***not*** the correct explanation of statement 1.
(c) Statement 1 is true but statement 2 is false.
(d) Statement 1 is false but statement 2 is true.

42. The volume occupied by 8.8 g of CO_2 at 32°C and 1 bar pressure is :

(where R = 0.083 bar dm^3 K^{-1} mol^{-1}; atomic weight of C = 12, O = 16)

(a) 8.02 dm^3
(b) 5.06 dm^3
(c) 6.15 dm^3
(d) 10.2 dm^3

43. Boyle's law is applicable to :

(a) Isobaric processes
(b) Isochoric processes
(c) Isothermal processes
(d) Isotonic processes

44. Which one of the following is ***not*** a fundamental assumption about the structure of gases in the kinetic theory of gases model ?

(a) A gas is composed of a very large number of minute particles (atoms/molecules)
(b) In the absence of a force field, these particles move in a straight line
(c) These particles interact (collide) with one another only infrequently
(d) In any collision, the total kinetic energy of the two molecules may change after the collision

45. Consider the following statements regarding the distribution of speeds of molecules :

1. The zero value of the first derivative of $\left(\frac{1}{N}\right)\left(\frac{dN_u}{du}\right)$ w.r.t. speed corresponds to the most probable speed u_{mp}.
2. At the same temperature, the oxygen molecule has a narrower distribution of speeds than the carbon dioxide molecule.
3. The area under the speed distribution curve of a particular gas at two different temperatures is the same.

Which of the statement(s) given above is/are correct ?

(a) 1 and 2
(b) 2 and 3
(c) 1 and 3
(d) 2 only

46. At what temperature will oxygen gas have the same root mean square speed as helium gas at 25°C ?
(a) 100°C
(b) 200°C
(c) 1056°C
(d) 2111°C

47. For any given molecule, the ratio of the average speed ($\bar{u}$), root mean square speed (u_{rms}) and most probable speed (u_{mp}) is respectively :
(a) 1.60 : 1.73 : 1.41
(b) 1.60 : 1.41 : 1.73
(c) 1.41 : 1.73 : 1.60
(d) 1.73 : 1.60 : 1.41

48. According to Gay-Lussac's law, which one of the following relations for the frequency (Z_{11}) of binary collisions of gas molecules at constant volume is correct ?
(a) $Z_{11} \propto T^{1/2}$ and $Z_{11} \propto p^{1/2}$
(b) $Z_{11} \propto T$ and $Z_{11} \propto p^{1/2}$
(c) $Z_{11} \propto T^2$ and $Z_{11} \propto p$
(d) $Z_{11} \propto T^2$ and $Z_{11} \propto p^2$

49. Which one of the following statements is ***not*** correct ?
(a) In a gas mixture, each gas contributes to the total pressure.
(b) These are large intermolecular forces in an ideal gas.
(c) The volume of the gas is essentially the volume of the container.
(d) The pressure of the gas is due to collisions with the walls of the container.

50. A balloon containing a piece of dry ice (solid CO_2) expands when the dry ice sublimes. Which one of the following is true about the system ?
(a) Work is done by the system
(b) Work is done on the system
(c) No work is done
(d) Work appears only after the change in state

51. A gas in a piston chamber kept in a constant temperature bath at 27°C expands from 25 mL to 250 mL very slowly. If there are 0.001 moles of an ideal gas in the chamber, the work done during the expansion is :
(where R = 8.31 J K^{-1} mol^{-1}; *ln* 10 = 2.3)
(a) – 5.74 J
(b) – 2.49 J
(c) 2.49 J
(d) 5.74 J

52. Consider the following statements for an ideal gas undergoing reversible process :
1. The quantity of the work w in a reversible process in a closed system can be found if we know the initial state and final state of the system.
2. The infinitesimal p – V work in a closed system always equals – p dV.
3. $\int_1^2 p\,dV = \int_1^2 nR\,dT$ for every reversible process in an ideal gas.

Which of the statement(s) given above is/are correct ?
(a) 1 only
(b) 2 only
(c) 2 and 3
(d) 1 and 3

53. dw and dq are ***not*** exact differentials because w and q are :
(a) State functions
(b) Path functions
(c) Intensive properties
(d) Extensive properties

54. For a given process of an ideal gas, dw = 0 and dq < 0. Then, for this gas :
(a) The temperature will decrease
(b) The volume will increase
(c) The pressure will remain constant
(d) The temperature will increase

55. A cylinder fitted with a frictionless piston containing 2.0 mol of He gas at 1 bar is kept in a large constant-temperature bath at 100 K. The pressure is reversibly increased to 2.0 bar. The w, q and ΔU for this process are respectively :
(Given R = 8.3 J K^{-1} mol^{-1}, *ln* 2 = 0.69)
(a) 1145 J, – 1145 J, 0 J
(b) – 1145 J, 1145 J, 0 J
(c) 498 J, – 498 J, 1 J
(d) – 498 J, 498 J, 1 J

56. The inversion temperature of a gas is :
(where a and b are van der Waals constants; R = universal gas constant)

(a) $\frac{2a}{Rb}$

(b) $\frac{2b}{Ra}$

(c) $\frac{Rb}{2a}$

(d) $\frac{Ra}{2b}$

57. Which one of the following state functions must remain constant in the Joule-Thomson experiment ?

(a) Entropy
(b) Gibbs free energy
(c) Internal energy
(d) Enthalpy

58. The standard enthalpy of formation of sodium ions in aqueous medium is :
(where ΔH_f° [NaOH(aq)] = – 471 kJ mol^{-1}; ΔH_f° [OH^-(aq)] = – 229 kJ mol^{-1})

(a) 242 kJ mol^{-1}
(b) 700 kJ mol^{-1}
(c) – 242 kJ mol^{-1}
(d) – 700 kJ mol^{-1}

59. Which one of the following thermodynamic relations is correct ?

(a) $\left(\frac{\partial S}{\partial T}\right)_p = \frac{1}{T}\left(\frac{\partial H}{\partial T}\right)_p$

(b) $\left(\frac{\partial S}{\partial p}\right)_T = \frac{1}{T}\left[\left(\frac{\partial H}{\partial p}\right)_T + V\right]$

(c) $\left(\frac{\partial S}{\partial V}\right)_T = \frac{1}{T}\left[p - \left(\frac{\partial U}{\partial T}\right)_V\right]$

(d) $\left(\frac{\partial S}{\partial T}\right)_V = -\frac{1}{T}\left(\frac{\partial U}{\partial T}\right)_V$

60. For the freezing of 2.0 g of liquid water at 0°C and 1 atm, the change in entropy ΔS is about :
(where, enthalpy of fusion of water = 6.0 kJ mol^{-1})

(a) + 0.8 JK^{-1}
(b) + 1.4 JK^{-1}
(c) – 2.4 JK^{-1}
(d) – 3.6 JK^{-1}

61. When 100 g of water is reversibly heated from 27°C to 127°C at 1 bar, the change in entropy (ΔS) for the process is about :
(Given : the specific heat capacity C_p of water is nearly constant at 4.2 J g^{-1} $°C^{-1}$ in the temperature range 27°C to 127°C at 1 bar; $ln\ 4 = 1.39$; $ln\ 3 = 1.10$)

(a) 29.4 JK^{-1}
(b) 122 JK^{-1}
(c) 7.0 JK^{-1}
(d) 96.6 JK^{-1}

62. Consider the following statements regarding entropy in a closed system :

1. ΔS can never be negative.
2. For a reversible process, ΔS_{univ} must be zero.
3. For an adiabatic process, ΔS cannot be negative.
4. Equilibrium is reached when S achieves its maximum.

Which of the statement(s) given above is/are correct ?

(a) 1 and 2
(b) 2 and 3
(c) 3 and 4
(d) 3 only

63. Which of the following thermodynamic relations are correct ?

1. $\left(\frac{\partial U}{\partial S}\right)_V = \left(\frac{\partial H}{\partial S}\right)_p$
2. $\left(\frac{\partial U}{\partial V}\right)_S = \left(\frac{\partial A}{\partial V}\right)_T$
3. $\left(\frac{\partial H}{\partial p}\right)_S = \left(\frac{\partial G}{\partial p}\right)_T$
4. $\left(\frac{\partial A}{\partial T}\right)_V = \left(\frac{\partial U}{\partial S}\right)_T$

Select the answer using the code given below :

(a) 1, 2, 3 and 4
(b) 3 and 4 only
(c) 1, 2 and 4 only
(d) 1, 2 and 3 only

64. Consider the following reaction :
Glucose – 6 – Phosphate + Creatine → Glucose + Creatine – P (Creatine phosphate)
What is the value of ΔG° for the reaction given above ?
[Given : The ΔG° values for the hydrolysis of Creatine – P and Glucose – 6 – Phosphate are :
Creatine – P + H_2O → Creatine + P, $\Delta G^\circ = -30.0$ kJ mol^{-1}
Glucose – 6 – Phosphate + H_2O → Glucose + P, $\Delta G^\circ = -11.8$ kJ mol^{-1}]
(a) -10.2 kJ mol^{-1}
(b) 12.2 kJ mol^{-1}
(c) 18.2 kJ mol^{-1}
(d) 24.8 kJ mol^{-1}

65. Consider the following conditions :
1. ΔH = – ve ΔS = + ve
2. ΔH = + ve ΔS = – ve
3. ΔH = – ve ΔS = – ve
4. ΔH = + ve ΔS = + ve
Which one of the following is correct with respect to the above conditions ?
(a) Condition (1) will always lead to a spontaneous change and condition (2) will never lead to a spontaneous change.
(b) Condition (1) will never lead to a spontaneous change and condition (2) will always lead to a spontaneous change.
(c) Condition (1) will always lead to a spontaneous change and condition (3) will never lead to a spontaneous change.
(d) Condition (3) will always lead to a spontaneous change and condition (4) will never lead to a spontaneous change.

66. Which one of the following is ***not*** a colligative property ?
(a) Depression of freezing point
(b) Relative lowering of vapour pressure
(c) Molar refractivity
(d) Elevation of boiling point

67. The osmotic pressure of blood at 37°C is 7.5 bar. The amount of glucose to be used per dm^3 for an intravenous injection to have the same osmotic pressure as blood is approximately :
(where R = 0.083 dm^3 bar K^{-1} mol^{-1})
(a) 52.5 g
(b) 5.25 g
(c) 60.0 g
(d) 180.0 g

68. Consider the following statements :
Statement 1 :
Meats are preserved in salt.
Statement 2 :
The cells of the bacteria lose water by osmosis to the hypertonic solution and eventually die.
Which one of the following is correct in respect of above statements ?
(a) Both statement 1 and statement 2 are true and statement 2 is the correct explanation of statement 1.
(b) Both statement 1 and statement 2 are true but statement 2 is ***not*** the correct explanation of statement 1.
(c) Statement 1 is true but statement 2 is false.
(d) Statement 1 is false but statement 2 is true.

69. Which one of the following expressions represents the ebullioscopic constant of a solvent ?
(where R = Gas constant; T_b = boiling point; ΔH_{vap} = molar heat of vaporization of the solvent; M_1 = molar mass of the solvent)
(a) $\frac{R M_1 \Delta H_{vap}}{T_b}$
(b) $\frac{R T_b^2 M_1}{\Delta H_{vap}}$
(c) $\frac{R T_b M_1}{\Delta H_{vap}}$
(d) $\frac{R T_b \Delta H_{vap}}{M_1}$

70. The value of Henry's Law constant of acetone in chloroform at 25°C is 20 kPa. When the mole fraction of acetone in the solution is 0.30, the vapour pressure of acetone will be :
(a) 6.0 kPa
(b) 0.6 kPa
(c) 0.2 kPa
(d) 0.15 kPa

71. The ratio of the cell constant and resistance is :

(a) Electromotive force
(b) Specific conductance
(c) Equivalent conductance
(d) Standard potential

72. A conductivity cell was calibrated using 0.01 M KCl ($k = 1.4 \times 10^{-3}$ S cm^{-1}) in the cell, and the measured resistance was 700 Ω. When the cell was filled with 0.01 M $AgNO_3$ solution, the cell had a resistance of 800 Ω. The molar conductivity of $AgNO_3$ solution is :

(a) 0.1225 S cm^2 mol^{-1}
(b) 122.5 S cm^2 mol^{-1}
(c) 0.8163 S cm^2 mol^{-1}
(d) 816.3 S cm^2 mol^{-1}

73. The molar conductivities at infinite dilution Λ_m^∞ for $Ba(OH)_2$, $BaCl_2$ and NH_4Cl are 460 S cm^2 mol^{-1}, 240 S cm^2 mol^{-1} and 2130 S cm^2 mol^{-1} respectively. The Λ_m^∞ for NH_4OH will be :

(a) 2240 S cm^2 mol^{-1}
(b) 2470 S cm^2 mol^{-1}
(c) 2600 S cm^2 mol^{-1}
(d) 2340 S cm^2 mol^{-1}

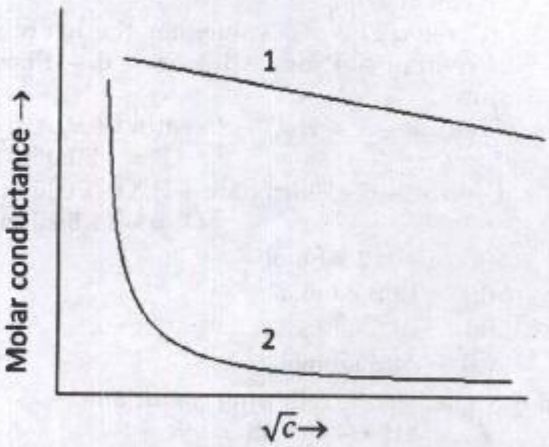
74. The conductivity of H^+ ion in aqueous medium is abnormally high due to :

(a) Hydration
(b) Proton jump
(c) Low charge density
(d) Large ionic radius

75. The equivalent conductance of a strong electrolytic solution :

(a) Decreases with dilution
(b) Increases with dilution
(c) Does not vary with dilution
(d) May increase or decrease with dilution depending on the nature of the strong electrolyte

76. Consider the following graph showing variation of molar conductance with concentration of strong and weak electrolytes :



Which one of the following statements is correct with respect to the above graph ?

(a) Both Plot 1 and Plot 2 can be explained using Debye-Hückel Theory.
(b) Both Plot 1 and Plot 2 can be explained using Arrhenius theory of electrolytic dissociation.
(c) Plot 1 and Plot 2 can be explained using Debye-Hückel Theory and Arrhenius theory of electrolytic dissociation respectively.
(d) Plot 1 and Plot 2 can be explained using Arrhenius theory of electrolytic dissociation and Debye-Hückel Theory respectively.

77. The term $B\Lambda^\infty \sqrt{c}$ in the Onsager equation $\Lambda = \Lambda^\infty - (A + B\Lambda^\infty)\sqrt{c}$ represents the :

(a) Decrease in molar conductivity due to electrophoretic effect
(b) Decrease in molar conductivity due to asymmetry effect
(c) Increase in molar conductivity due to electrophoretic effect
(d) Increase in molar conductivity due to asymmetry effect

78. Walden's rule holds good for :

(a) Large ions only

(b) Small ions only

(c) Any ion at normal temperature

(d) All ions except H^+

79. The molar conductivity of 0.02 M formic acid is 40 S cm^2 mol^{-1}. The degree of dissociation and dissociation constant are respectively :

[where, λ^{∞} $(H^+) = 350$ S cm^2 mol^{-1} and λ^{∞} $(HCOO^-) = 50$ S cm^2 mol^{-1}]

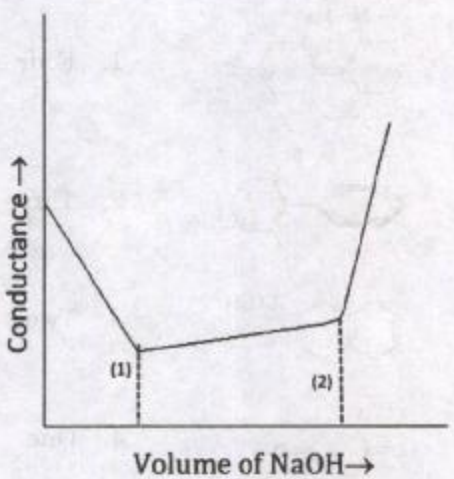
(a) 0.2 and 2.2×10^{-4}

(b) 0.1 and 2.2×10^{-6}

(c) 0.2 and 2.2×10^{-3}

(d) 0.1 and 2.2×10^{-4}

80. In the given plot of conductometric titration, the volumes corresponding to points (1) and (2) indicate respectively, the :



(a) Neutralization of strong acid and weak acid

(b) Neutralization of weak acid and strong acid

(c) Hydrolysis of salt formed and neutralization of weak acid

(d) Hydrolysis of salt formed and neutralization of strong acid

81. Which one of the following represents the correct increasing order of reactivity among indicated compounds towards electrophilic reagents ?

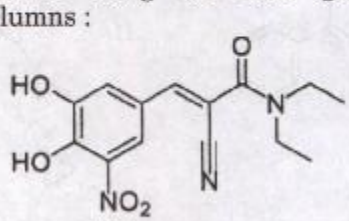
(a) $CH_2 = CHNO_2 < CH_2 = \overset{+}{C}HN(CH_3)_3 < CH_2 = CH_2 < CH_2 = CHCH_3 < CH_2 = CHBr < CH_2 = CHOCH_3$

(b) $CH_2 = \overset{+}{C}HN(CH_3)_3 < CH_2 = CHNO_2 < CH_2 = CH_2 < CH_2 = CHBr < CH_2 = CHCH_3 < CH_2 = CHOCH_3$

(c) $CH_2 = CHNO_2 < CH_2 = \overset{+}{C}HN(CH_3)_3 < CH_2 = CHBr < CH_2 = CH_2 < CH_2 = CHCH_3 < CH_2 = CHOCH_3$

(d) $CH_2 = \overset{+}{C}HN(CH_3)_3 < CH_2 = CHNO_2 < CH_2 = CHBr < CH_2 = CH_2 < CH_2 = CHOCH_3 < CH_2 = CHCH_3$

82. Entacapone is one of the constituents of drug used for Parkinson's disease. The structure of entacapone is shown below. Match the type of bond from Column-I with the respective bond label from Column-II and select the correct answer using the code given below the columns :



Entacapone

Column-I	*Column-II*
A. Longest C – C single bond	1. $CH_2 - CH_3$
B. Shortest C – C single bond	2. C – CN
C. Longest C – N single bond	3. $C - NO_2$
D. Shortest C – N single bond	4. C = N
	5. CH = C(CN)
	6. O = C – N
	7. $N - CH_2CH_3$

Code :

	A	B	C	D
(a)	5	2	6	7
(b)	1	5	7	4
(c)	2	1	4	3
(d)	5	2	3	6

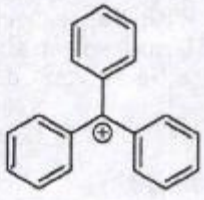
83. Consider the following statements :

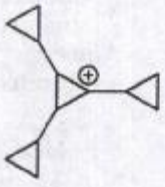
1. 2-Chloroprop-1-ene is more susceptible to attack by electrophiles than 3-chloroprop-1-ene.
2. Ethyl but-3-enoate is more susceptible to electrophilic attack than ethyl(*E*)-but-2-enoate.
3. Bicyclo[2.2.1]hept-2-ene is more stable than bicyclo[2.2.1]hept-1-ene.
4. 2,3-Dimethyl-2-hexene has lesser heat of hydrogenation than 4,5-dimethyl-2-hexene.

How many of the above statement(s) is/are correct ?

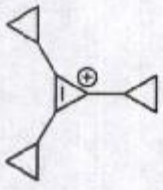
(a) One
(b) Two
(c) Three
(d) Four

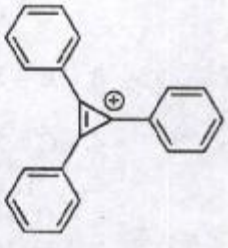
84. The relative increasing order of stability for the following carbocations is :

I. 

II. 

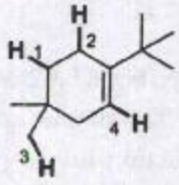
III. 

IV. 

V. 

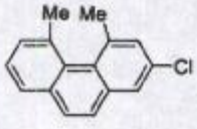
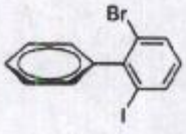
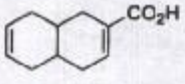
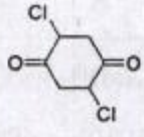
(a) II < I < V < III < IV
(b) I < II < V < III < IV
(c) II < I < IV < III < V
(d) I < II < III < IV < V

85. Rank the indicated C – H bonds in the following compound in order of increasing ease of H-abstraction in a radical halogenation reaction and select the correct answer accordingly :



(a) 4 < 3 < 2 < 1
(b) 2 < 1 < 3 < 4
(c) 3 < 4 < 1 < 2
(d) 4 < 3 < 1 < 2

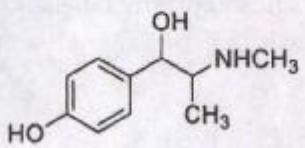
86. Match the compound from Column-I with the possible number of stereoisomers from Column-II and select the correct answer using the code given below the columns :

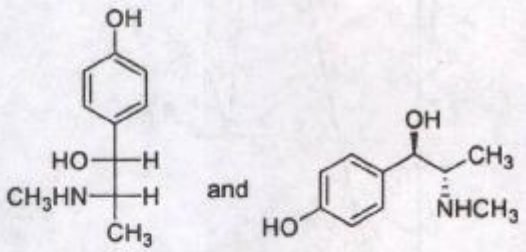
Column-I		*Column-II*
A.		1. Four
B.		2. Three
C.		3. Two
D.		4. One

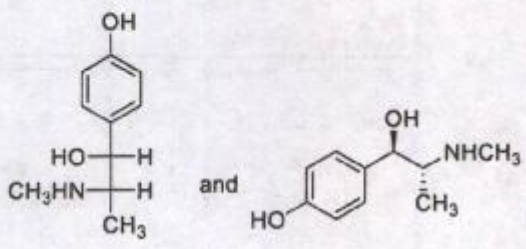
Code :

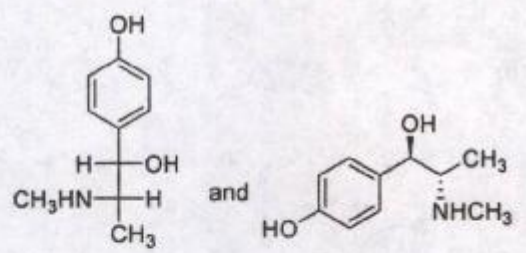
	A	B	C	D
(a)	2	1	4	3
(b)	2	4	1	3
(c)	3	4	1	2
(d)	3	1	4	2

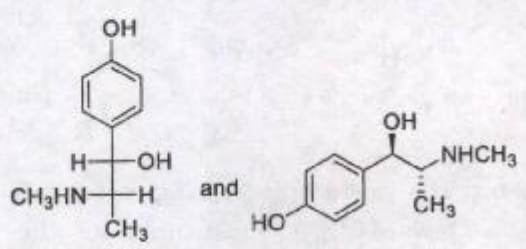
87. The Fischer projection formula and its corresponding zig-zag projection for the *erythro* configuration of the following compound are respectively :



(a) 

(b) 

(c) 

(d) 

88. The absolute configurations of chiral centres in the product formed in the following reaction is :

$(2R, 3R) — HOCH_2CHOHCHOHCH_2OH + HBr \longrightarrow HOCH_2CHOHCHOHCH_2Br$

(a) (2R, 3R)
(b) (2S, 3S)
(c) (2R, 3S)
(d) (2S, 3R)

89. Consider the following statements regarding the stereochemistry of 1, 4-dichlorocyclohexane :

1. It can exist as enantiomers but no diastereomers are possible.
2. It can exist as enantiomers as well as diastereomers.
3. It can exist as diastereomers but no enantiomers are possible.

Which of the statement(s) given above is/are correct ?

(a) 1 and 2
(b) 2 only
(c) 2 and 3
(d) 3 only

90. Consider the following statements regarding haloethanes :

Statement 1 :

Chloroethane and iodoethane have similar barrier to rotation around C1 – C2 bond (13.4 – 15.5 kJ/mol) despite the fact that the size of the halogen increases down the group in periodic table.

Statement 2 :

The C – Cl bond in chloroethane is much longer than C – I bond in iodoethane.

Which one of the following is correct in respect of above statements ?

(a) Both statement 1 and statement 2 are true and statement 2 is the correct explanation of statement 1.
(b) Both statement 1 and statement 2 are true but statement 2 is ***not*** the correct explanation of statement 1.
(c) Statement 1 is true but statement 2 is false.
(d) Statement 1 is false but statement 2 is true.

91. Consider the following statements regarding Reaction I and Reaction II :

Reaction I :

$$HO^- + CH_3OSO_2Ph \xrightarrow{S_N2} CH_3OH + PhSO_2O^-$$

Reaction II :

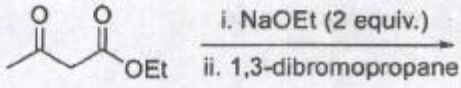
$$N(CH_2CH_3)_3 + CH_3CH_2I \xrightarrow{S_N2} (CH_3CH_2)_4N^+I^-$$

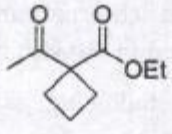
1. With increase in solvent polarity, the rate of Reaction I is slightly reduced.
2. With increase in solvent polarity, the rate of Reaction I is slightly increased.
3. With increase in solvent polarity, the rate of Reaction II is greatly increased.
4. With increase in solvent polarity, the rate of Reaction II is greatly decreased.

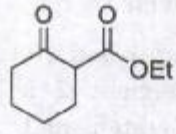
Which of the statements given above are correct ?

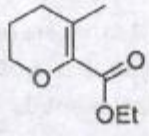
(a) 1 and 3
(b) 1 and 4
(c) 2 and 3
(d) 2 and 4

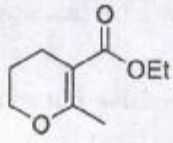
92. The major product formed in the following reaction sequence is :



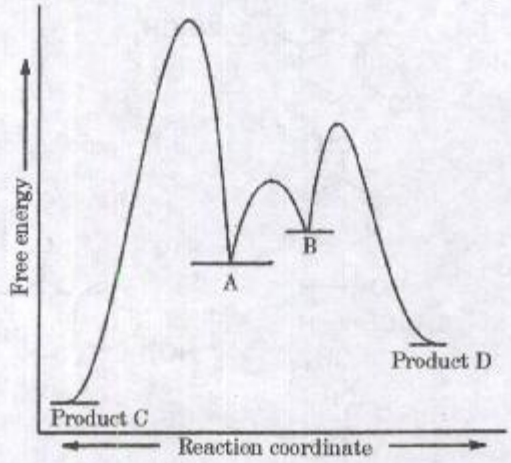
(a) 

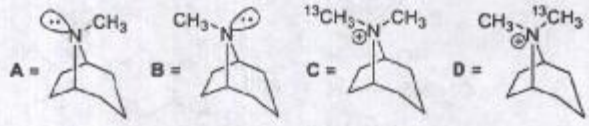
(b) 

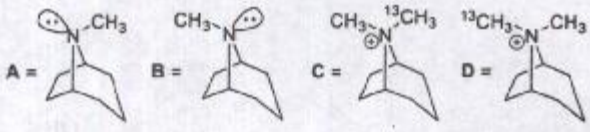
(c) 

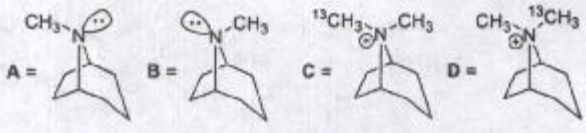
(d) 

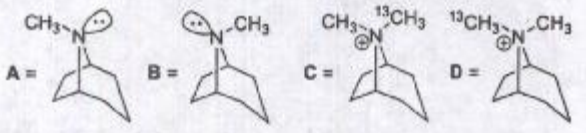
93. The structures of conformer **A** and **B** as well as the products **C** and **D** in the following free energy profile diagram for the S_N2 reaction of tropane with isotopically labelled $^{13}CH_3I$ is :



(a) 

(b) 

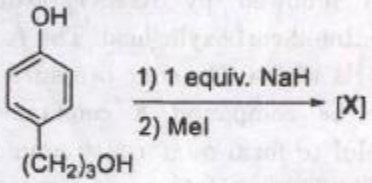
(c) 

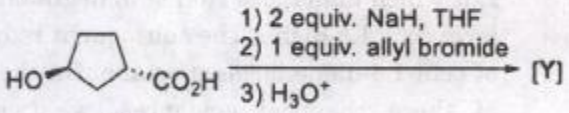
(d) 

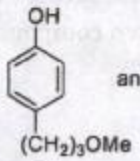
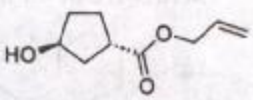
94. The correct increasing order of reactivity towards S_N1 substitution of the indicated compounds is :

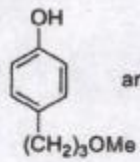
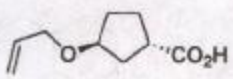
(a) sec-butyl triflate < sec-butyl tosylate < sec-butyl chloride < sec-butyl bromide
(b) sec-butyl chloride < sec-butyl bromide < sec-butyl triflate < sec-butyl tosylate
(c) sec-butyl chloride < sec-butyl bromide < sec-butyl tosylate < sec-butyl triflate
(d) sec-butyl triflate < sec-butyl tosylate < sec-butyl bromide < sec-butyl chloride

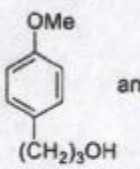
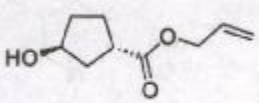
95. The major products [X] and [Y] formed in the following reactions are :

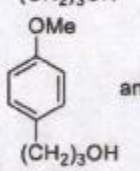
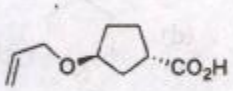




(a) [X] =  and [Y] = 

(b) [X] =  and [Y] = 

(c) [X] =  and [Y] = 

(d) [X] =  and [Y] = 

96. The following table shows the response of chemical analysis of compounds A – D using the indicated reagents :

Compound	Br_2/CCl_4	$KMnO_4$	$AgNO_3$	Conc. H_2SO_4
A	negative	negative	positive	negative
B	positive	positive	negative	positive
C	negative	negative	negative	positive
D	negative	negative	negative	negative

The compounds A – D on the basis of above data are :

(a) A = tert-pentyl alcohol, B = n-pentyl bromide, C = isobutylene, D = isobutane

(b) A = isobutane, B = n-pentyl bromide, C = isobutylene, D = tert-pentyl alcohol

(c) A = isobutane, B = tert-pentyl alcohol, C = isobutylene, D = n-pentyl bromide

(d) A = n-pentyl bromide, B = isobutylene, C = tert-pentyl alcohol, D = isobutane

97. The isomeric methyl piperidine with molecular formula $C_6H_{13}N$ shown in the Column-I undergo following set of reactions :

$$C_6H_{13}N \xrightarrow[\text{(iii) heat}]{\text{(i) excess } CH_3I/K_2CO_3,\ \text{(ii) } Ag_2O,\ H_2O} \xrightarrow[\text{(iii) heat}]{\text{(i) excess } CH_3I/K_2CO_3,\ \text{(ii) } Ag_2O,\ H_2O} \text{Major product}$$

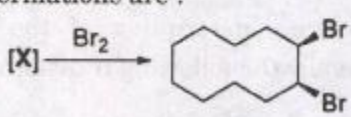
Match the isomeric methyl piperidine compound from Column-I with the major product formed from Column-II and select the correct answer using the code given below the columns :

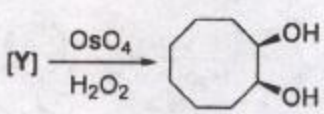
Column-I	*Column-II*
A. 1-Methylpiperidine	1. 1,4-hexadiene
B. 2-Methylpiperidine	2. 1,5-hexadiene
C. 3-Methylpiperidine	3. 1,4-pentadiene
D. 4-Methylpiperidine	4. 2-methyl-1,4-pentadiene
	5. 3-methyl-1,4-pentadiene

Code :

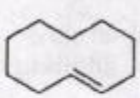
	A	B	C	D
(a)	2	3	1	5
(b)	3	1	5	4
(c)	3	2	4	5
(d)	2	4	1	3

98. The precursors [X] and [Y] in the following transformations are :





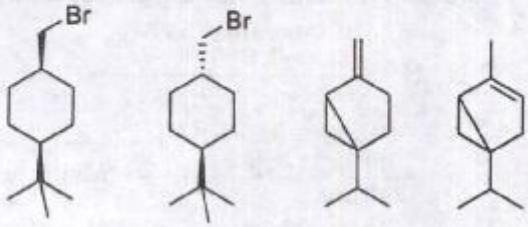
(a) [X] =  [Y] = 

(b) [X] =  [Y] = 

(c) [X] =  [Y] = 

(d) [X] =  [Y] = 

99. Consider the following statements regarding compounds I – IV :



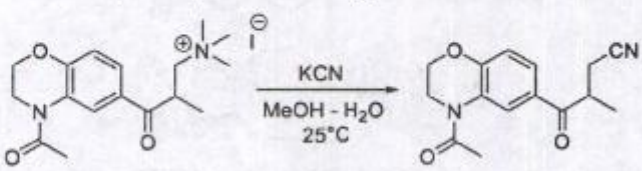
I II III IV

1. Compound I reacts with $KOCMe_3$ in t-butyl alcohol faster than compound II.
2. Compound I reacts with $KOCMe_3$ in t-butyl alcohol slower than compound II.
3. Compound III undergoes acid-catalyzed hydration faster than compound IV.
4. Compound III undergoes acid-catalyzed hydration slower than compound IV.

Which of the statements given above are correct ?

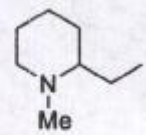
(a) 1 and 3
(b) 1 and 4
(c) 2 and 3
(d) 2 and 4

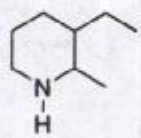
100. The correct description of the mechanism adopted by the following transformation is :

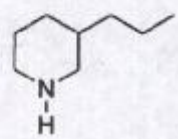


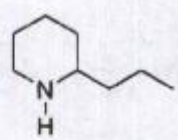
(a) E1 elimination followed by 1,4-conjugate addition of cyanide anion
(b) E2 elimination followed by 1,4-conjugate addition of cyanide anion
(c) E1cB elimination followed by 1,4-conjugate addition of cyanide anion
(d) Straightforward S_N2 pathway involving cyanide anion as nucleophile

101. The natural product **X** ($C_8H_{17}N$) on zinc distillation followed by $KMnO_4$ oxidation forms pyridine-2-carboxylic acid. The reaction of **X** with HI at 300°C under pressure forms n-octane. The compound **X** consumes two moles of MeI to form quaternary ammonium salt which undergoes Hofmann degradation to form octa-1,4-diene. The subsequent reduction of octa-1,4-diene forms n-octane. On the basis of these chemical evidences, what is the structure of an unknown compound **X** ?

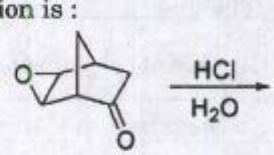
(a) 

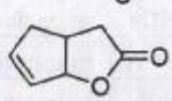
(b) 

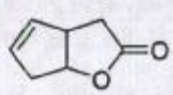
(c) 

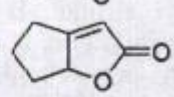
(d) 

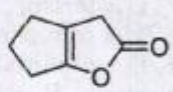
102. The major product formed in the following reaction is :



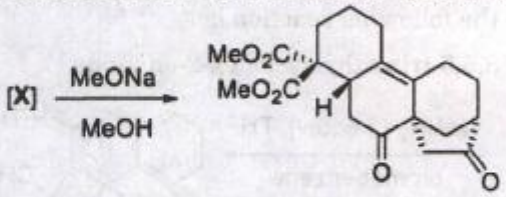
(a) 

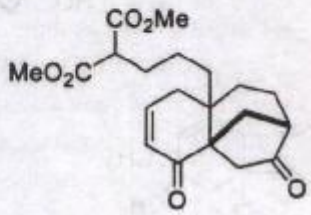
(b) 

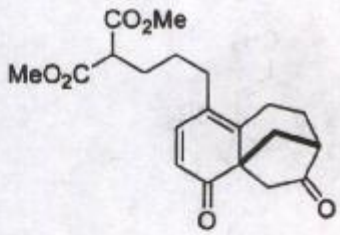
(c) 

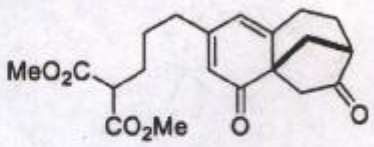
(d) 

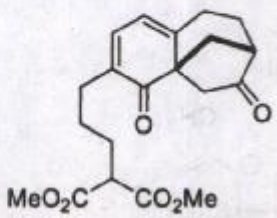
103. The precursor [X] in the following reaction is :



(a)


(b)


(c)


(d)


104. Consider the following statements :

1. The addition of HBr to 3-methyl-2-pentene is a stereospecific reaction.
2. The addition of HBr to 3-methyl-2-pentene is a stereoselective reaction.
3. The addition of HBr to 3-methyl-2-pentene is a regioselective reaction.

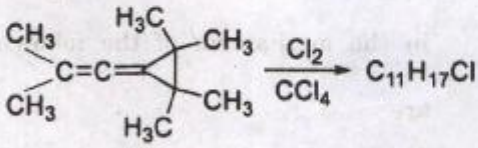
Which of the statement(s) given above is/are correct ?

(a) 1 and 2
(b) 1 and 3
(c) 2 and 3
(d) 3 only

105. Which one of the following alkenes ***cannot*** produce 3-chloro-3-methylhexane as the major product by addition of HCl ?

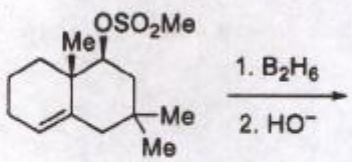
(a) 3-ethylpent-2-ene
(b) 3-methylenehexane
(c) (*E*)-3-methylhex-2-ene
(d) (*Z*)-3-methylhex-3-ene

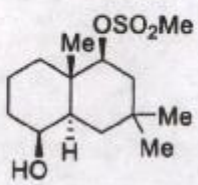
106. The number of sp and sp^2 carbons present in the major product ($C_{11}H_{17}Cl$) formed in the following reaction are :

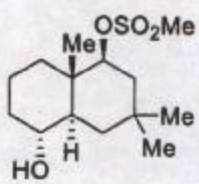


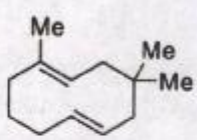
(a) Zero and two respectively
(b) Two and zero respectively
(c) Two and two respectively
(d) Zero and four respectively

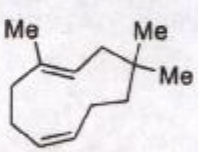
107. The major product formed in the following reaction sequence is :



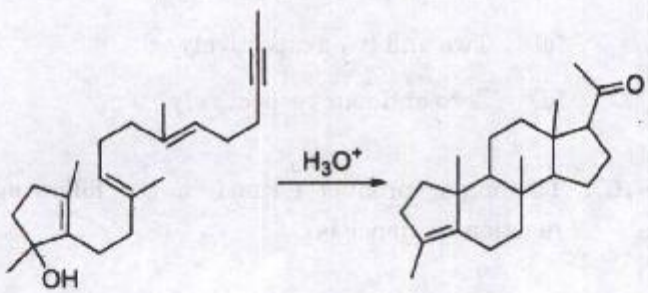
(a)


(b)


(c)


(d)


108. The number of potential tertiary carbocations as reactive intermediates likely to be formed in the mechanism of the following reaction are :



(a) Three

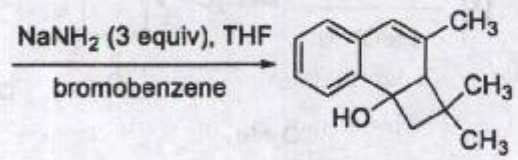
(b) Four

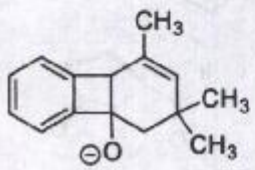
(c) Five

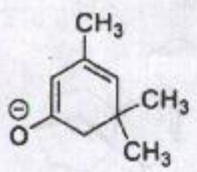
(d) Six

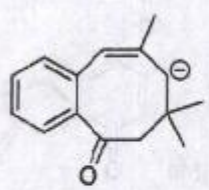
109. The reactive intermediates likely to form in the following reaction is :

3,5,5-trimethylcyclohex-2-en-1-one

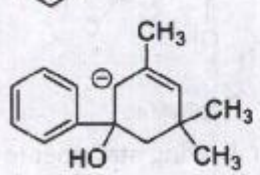


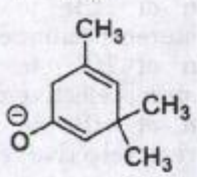
I. 

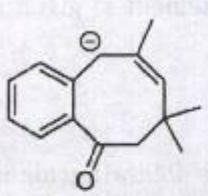
II. 

III. 

IV. 

V. 

VI. 

VII. 

(a) I, II, III and IV
(b) IV, V, VI and VII
(c) II, IV, V and VII
(d) II, III, V and VII

110. Which one of the following statements is correct regarding the reaction mechanism, if we assume the presence of kinetic isotope effect in aromatic electrophilic substitution ?

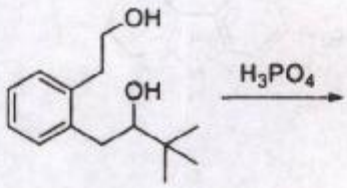
(a) C_6D_6 will react faster than C_6H_6 under identical reaction conditions.

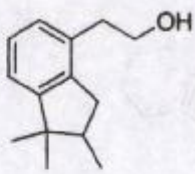
(b) The formation of σ-complex is a rate determining step.

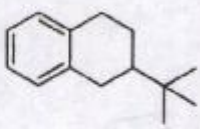
(c) The o/p-ratio of the products formed from anisole will be less than that of 4-deuterioanisole.

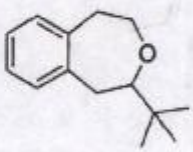
(d) The D/H ratio will be higher in the reactant than the major product formed when 1,3,5-trideuteriobenzene undergoes mono-electrophilic substitution reaction.

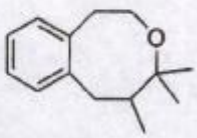
111. The major product formed in the following reaction is :



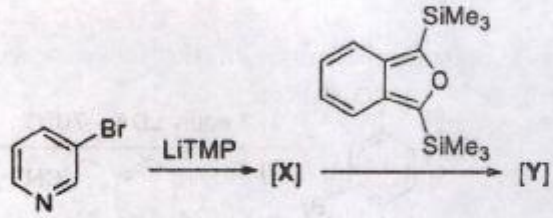
(a) 

(b) 

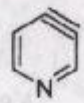
(c) 

(d) 

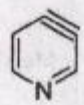
112. The reactive intermediate and the major product formed in the following reaction is :

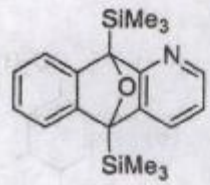


Lithium tetramethylpiperidide, LiTMP, is a strong non-nucleophilic base.

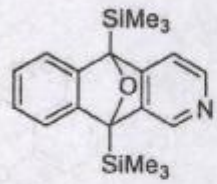
(a) [X] = 

[Y] = 

(b) [X] = 

[Y] = 

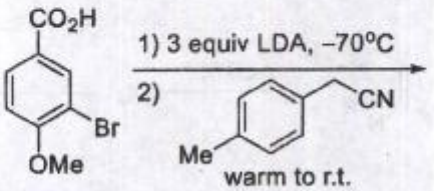
(c) [X] = 

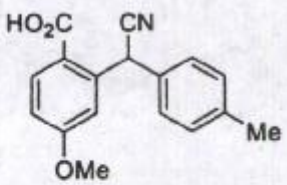
[Y] = 

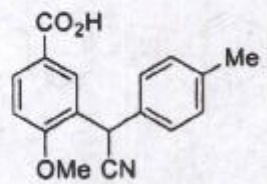
(d) [X] = 

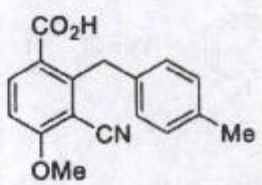
[Y] = 

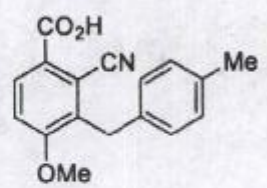
113. The major product formed in the following reaction is :



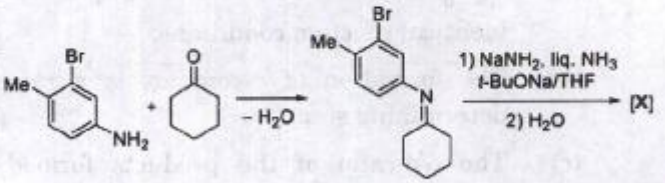
(a) 

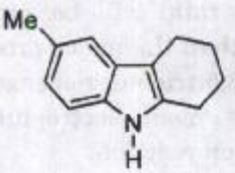
(b) 

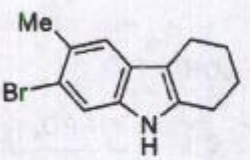
(c) 

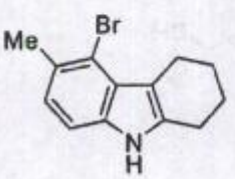
(d) 

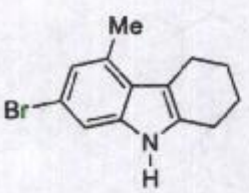
114. The major product [X] formed in the following reaction sequence is :



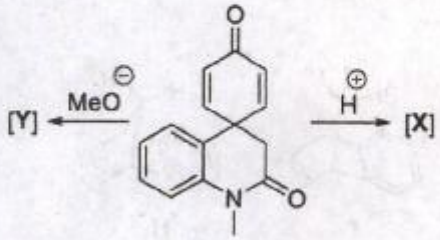
(a) 

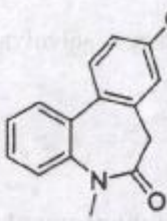
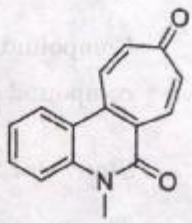
(b) 

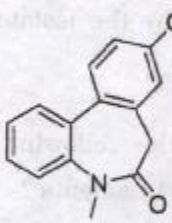
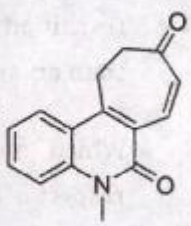
(c) 

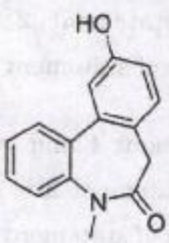
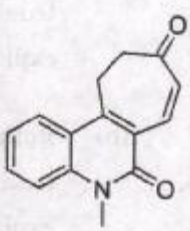
(d) 

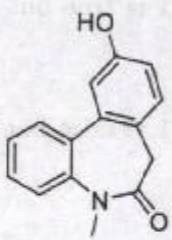
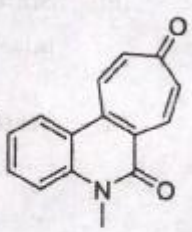
115. The major products [X] and [Y] formed in the following reactions are :



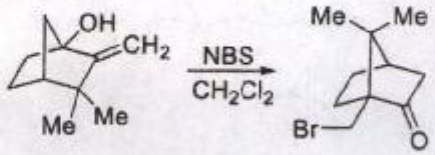
(a) [X] =  [Y] = 

(b) [X] =  [Y] = 

(c) [X] =  [Y] = 

(d) [X] =  [Y] = 

116. The mechanism of the following reaction sequentially involves the :



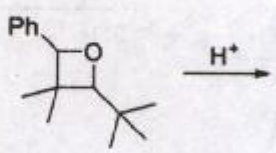
(a) conversion of 3° carbocation to oxocarbenium ion

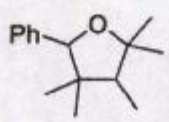
(b) conversion of 2° carbocation to oxocarbenium ion

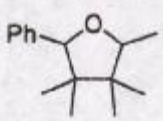
(c) conversion of 3° carbocation to 1° carbocation

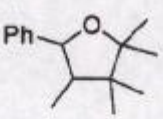
(d) conversion of 2° carbocation to 1° carbocation

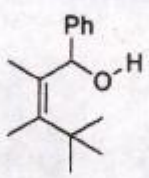
117. The major product formed in the following reaction is :



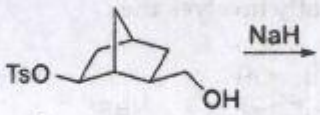
(a) 

(b) 

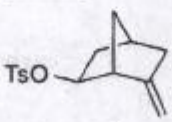
(c) 

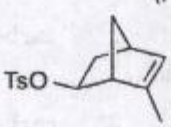
(d) 

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



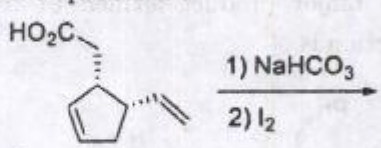
(a) 

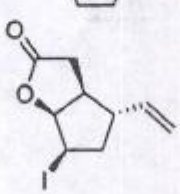
(b) 

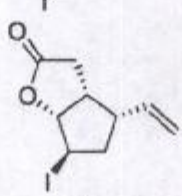
(c) 

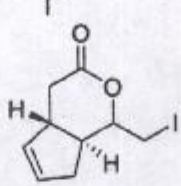
(d) 

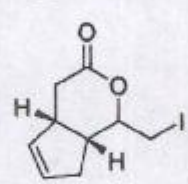
119. The major product formed in the following reaction sequence is :



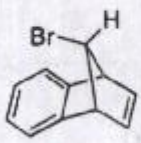
(a) 

(b) 

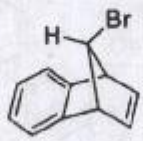
(c) 

(d) 

120. Consider the following statements regarding the solvolysis of compounds I and II in acetic acid :



I



II

Statement 1 :

Compound I undergo solvolysis faster than compound II.

Statement 2 :

The greater rate enhancement in compound I than II is due to the effective stabilization of transition state by the isolated double bond than an aryl ring.

Which one of the following is correct in respect of above statements ?

(a) Both statement 1 and statement 2 are true and statement 2 is the correct explanation of statement 1.

(b) Both statement 1 and statement 2 are true but statement 2 is ***not*** the correct explanation of statement 1.

(c) Statement 1 is true but statement 2 is false.

(d) Statement 1 is false but statement 2 is true.

SPACE FOR ROUGH WORK

SPACE FOR ROUGH WORK

SPACE FOR ROUGH WORK

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