

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE ASKED TO DO SO**TEST BOOKLET SERIES**

TEST BOOKLET
A.P. (CC) CHEMISTRY 2016



Time Allowed : 2 Hours]

[Maximum Marks : 100

All questions carry equal marks.

INSTRUCTIONS

1. Immediately after the commencement of the examination, you should check that 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. **Encode clearly the test booklet series A, B, C or D as the case may be in the appropriate place in the answer sheet.**
3. Write your Roll Number only in the box provided alongside.
Do not write anything else on the Test Booklet.
4. This Test Booklet contains **100** items (questions). Each item comprises four responses (answers). Choose only one response for each item which you consider the best.
5. After the candidate has read each item in the Test Booklet and decided which of the given responses is correct or the best, he has to mark the circle containing the letter of the selected response by blackening it completely with Black or Blue ball pen. In the following example, response "C" is so marked :

(A)
(B)
●
(D)
6. Do the encoding carefully as given in the illustrations. While encoding your particulars or marking the answers on answer sheet, you should blacken the circle corresponding to the choice in full and no part of the circle should be left unfilled. After the response has been marked in the ANSWER SHEET, erasing/fluid is allowed.
7. You have to mark all your responses **ONLY** on the ANSWER SHEET separately given according to 'INSTRUCTIONS FOR CANDIDATES' already supplied to you. *Responses marked on the Test Booklet or in any paper other than the answer sheet shall not be examined.*
8. All items carry equal marks. Attempt all items. Your total marks will depend only on the number of correct responses marked by you in the Answer Sheet. There will be no negative marking.
9. Before you proceed to mark responses in the Answer Sheet fill in the particulars in the front portion of the Answer Sheet as per the instructions sent to you.
10. If a candidate give more than one answer, it will be treated as a wrong answer even if one of the given answers happens to be correct.
11. After you have completed the test, hand over the Answer Sheet only, to the Invigilator.

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1. The kinetic energy operator is :

(A) $-\frac{\hbar^2}{2m} \frac{\partial^2}{\partial x^2} + U$

(B) $i\hbar \frac{\partial}{\partial t}$

(C) $\frac{\hbar}{i} \frac{\delta}{\partial x}$

(D) $-\frac{\hbar^2}{2m} \frac{\partial^2}{\partial x^2}$

2. The strength of a solution which does not depend upon temperature is represented as :

(A) normality

(B) molarity

(C) molality

(D) formality

3. An element with atomic number 118 has been recently named as :

(A) Oganesson

(B) Moscovium

(C) Nihonium

(D) Tennessine

4. Helium behaves unusually at low temperature. Recall phase diagram of helium. Which of the following statements is *not* correct ?

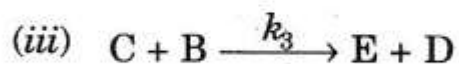
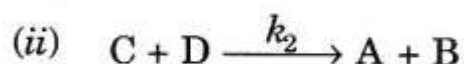
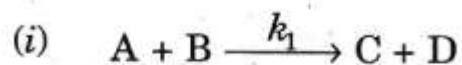
(A) He(s) and He(g) exists in equilibrium at very low temperature

(B) He has liquid-liquid transition at its λ line. The liquid He(I) behaves like a normal liquid while He(II) is a superfluid

(C) Liquids He(I) and He(II) and He(Vapour) are in equilibrium at 2.17 K and about 0.05 atm

(D) The position of the triple point of pure substance is outside our control and it occurs at single definite pressure and temperature characteristic of the substance

5. For the following reaction mechanism :



The differential rate law expression for the removal of C is :

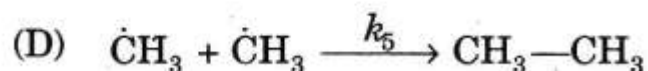
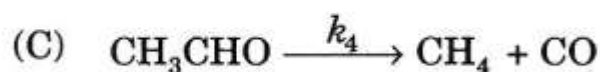
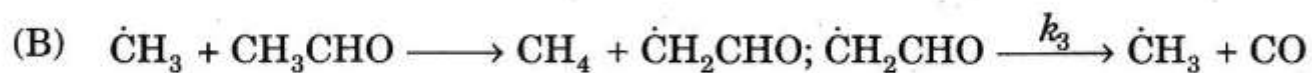
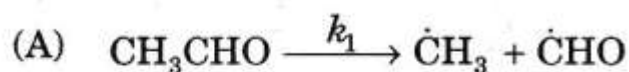
$$(A) \quad k_2[C][D] + k_3[C][B] - k_1[A][B]$$

$$(B) \quad k_2[C][D] - k_1[A][B] - k_3[C][B] + 2k_4[D]^2$$

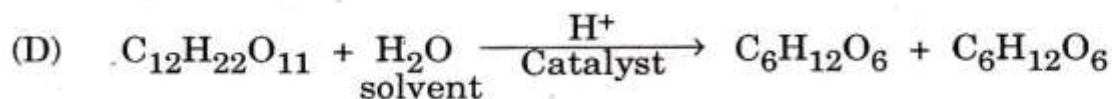
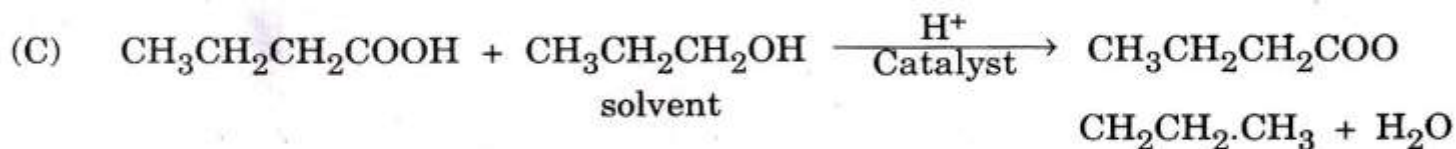
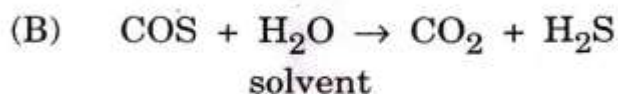
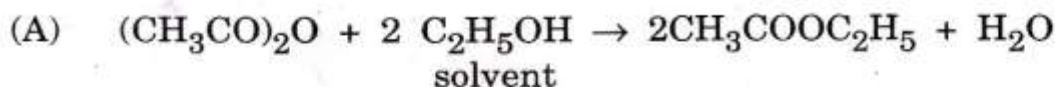
$$(C) \quad k_1[A][B] - k_2[C][D] + k_3[C][B]$$

$$(D) \quad k_1[A][B] - k_2[C][D]$$

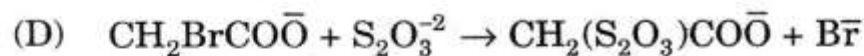
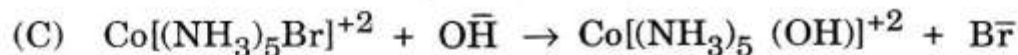
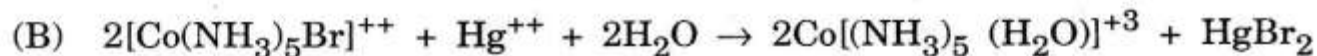
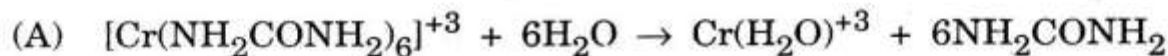
6. Which of the following reactions is *not* a part of reaction mechanism for thermal decomposition of acetaldehyde ?



7. Which of the following is *not* a pseudo unimolecular reaction ?



8. In which of the following reactions the rate constant of a reaction is not affected by ionic strength ?



9. Which of the following is an expression for thermodynamic equation of state ?

(A) $\Delta A = \Delta E + T \left[\frac{\delta(\Delta A)}{\delta T} \right]_V$

(B) $\Delta F = \Delta H + T \left[\frac{\delta(\Delta F)}{\delta T} \right]_P$

(C) $\left(\frac{\partial T}{\partial P} \right)_H = \frac{1}{C_P} \left[T \left(\frac{\delta V}{\delta T} \right)_P - V \right]$

(D) $P = T \left(\frac{\partial P}{\partial T} \right)_V - \left(\frac{\delta E}{\delta V} \right)_T$

10. The standard molar enthalpy of formation of CO_2 is equal to :
- (A) the sum of standard molar enthalpies of formation of amorphous carbon and oxygen
 - (B) the standard molar enthalpy of combustion of carbon (graphite)
 - (C) the standard molar enthalpy of combustion of gaseous carbon
 - (D) the sum of standard molar enthalpies of formation of CO and O_2
11. A system which can exchange energy but not matter with surrounding is called :
- (A) isolated system
 - (B) closed system
 - (C) open system
 - (D) heterogeneous system
12. Which of the following is a statement of Nernst heat theorem ?
- (A) The energy of an isolated system remains constant during a specified change of state but it does not tell whether a specified change or a process including a chemical reaction can occur spontaneously i.e. whether it is feasible. The energy of the universe is constant
 - (B) In a reversible process the entropy of the system and surrounding taken together remains constant while in an irreversible process the entropy of the system and surrounding taken together increases the entropy of the universe tends towards maximum
 - (C) The entropy of a pure crystalline substance becomes zero at absolute zero
 - (D) The value of $\frac{\delta(\Delta G)}{\delta T}$ approaches zero gradually as the temperature is lowered towards absolute zero

$$\text{i.e. } \lim_{T \rightarrow 0} \frac{\delta(\Delta G)}{\delta T} = \lim_{T \rightarrow 0} \frac{\delta(\Delta H)}{\delta T} = 0$$

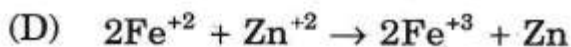
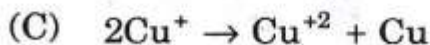
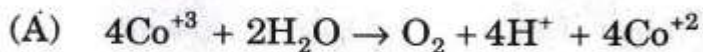
13. Given :

$$E^\circ_{\text{CO}^{+3}/\text{CO}^{+2}} = 1.82 \text{ V}; E^\circ_{\text{H}_2\text{O}/\text{O}_2} = -1.23 \text{ V}; E^\circ_{\text{Fe}^{+3}/\text{Fe}^{+2}} = +0.771 \text{ V};$$

$$E^\circ_{\text{Fe}^{+2}/\text{Fe}} = -0.44 \text{ V}; E^\circ_{\text{Cu}^{+2}/\text{Cu}^{+1}} = +0.15 \text{ V}; E^\circ_{\text{Cu}^{+}/\text{Cu}} = +0.53 \text{ V};$$

$$E^\circ_{\text{Fe}^{+3}/\text{Fe}^{+2}} = +0.771 \text{ V}; E^\circ_{\text{Zn}^{+2}/\text{Zn}} = -0.763 \text{ V}$$

Which of the following reactions is *not* spontaneous ?



14. Which of the following statements is *not* correct ?

(A) The activity coefficient of a given strong electrolyte is the same in all solutions of the same ionic strength

(B) In dilute solutions electrolytes of the same valence type have been found to have equal activity coefficients at the same ionic strength

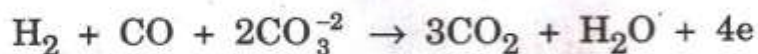
(C) For a uni-univalent electrolyte the molality of each ion is m and its valency 1 so that μ_m (ionic strength) = m

Similarly for a bi-bivalent electrolyte the molality of each ion is $2m$ and its valency 2, hence ionic strength (μ_m) = $4m$

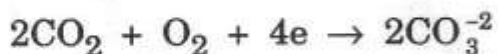
(D) For a uni-bivalent electrolyte the molality of the positive is $2m$ and its valency 1, whereas the molality of the negative ion is m and its valency 2, hence ionic strength is $2m$

15. Which of the following set of cell reactions takes place in hydrocarbon oxygen fuel cell ?

(A) Overall (anode) half cell reaction



Reduction (cathode) half cell reaction



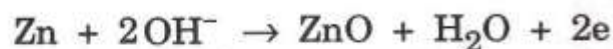
(B) Oxidation half cell reaction



Reduction half cell reaction



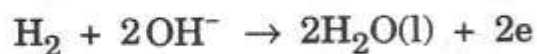
(C) Oxidation (zinc anode) half cell reaction



Reduction half cell reaction



(D) Oxidation half cell reaction



Reduction half cell reaction



16. Which of the following statements is *not* correct with regard to Debye-Hückel theory of strong electrolytes ?

- (A) An electrolyte is almost completely ionised in solution at all concentrations. Increase in molar conductance with dilution is due to increase in mobility of ions due to weaker interionic attraction
- (B) Each ion is surrounded by ions of opposite charge giving rise an ionic atmosphere. Under an influence of electric field the positive charge central ion moves toward the cathode while its negative ion atmosphere tends to move towards anode. The symmetry of ions gets disturbed and an atmosphere becomes distorted. The central ion experiences a retarding force which tend to drag it backward. The drag on central ion is called asymmetry effect. This is also true for a negative charge central ion surrounded by an atmosphere of positive charge ions
- (C) The motion of central ion is also opposed by molecules of water of hydration in ion atmosphere at higher concentration which itself is moving with the negative ion atmosphere towards positive electrode. Similarly a negative ion moves towards anode through the medium associated with positive ion atmosphere moving towards negative electrode. These countercurrent slows down and the effect is called electrophoretic effect
- (D) Viscosity of the medium also affects the motion of ions. The central ion gets slowed down by viscous force of the solvent. Debye, Hückel and Onsager gave the relation :

$$\lambda_m^0 - \lambda_m = \left[\frac{82.4}{(DT)^{1/2} \cdot n} + \frac{8.20 \times 10^5}{(DT)^{1/2}} \lambda_m^0 \right] \sqrt{c}$$

The first term gives a measure of asymmetric effect and the second term gives the electrophoretic effect.

The conductance behaviour of the solution of a strong electrolyte has been examined by Debye-Falkenhagen under high AC frequencies and concluded the presence of the both these effects.

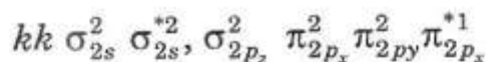
17. Which of the following statements is *not* correct ?

- (A) Lyophobic sols have no spontaneous tendency to pass into colloidal state and are difficultly obtained while lyophilic colloids are easily obtained by spontaneous dispersion of a substance in the dispersion medium
- (B) Lyophilic sols have viscosity almost equal to that of the dispersion medium while lyophobic sols have very high viscosities. The dispersed phase particles are often highly solvated in lyophobic systems but not so in lyophilic systems
- (C) Lyophobic sol particles carry charges either positive or negative and migrate towards the proper electrode when placed in an electrical field. Lyophilic sol particles do not move towards one electrode or the other very slowly
- (D) Very small amount of neutral electrolyte solution brings about precipitation of the dispersed phase in lyophobic colloids but hardly it has an effect on lyophilic sol

18. In a photochemical reaction the primary process in which a light quantum $h\nu$ is absorbed by a molecule A resulting in an excited molecule A^* which gets dissociated to give excited state atom or free radicals. The secondary process in which an excited state atom or free radical produced in the primary process react further to give the products

Which of the following statements is *not* correct as a reason for low quantum yield ?

- (A) The excited molecule is deactivated through fluorescence or phosphorescence
- (B) The excited molecule is deactivated by converting its energy into kinetic energy of other molecules and can gradually be degraded into heat
- (C) The secondary process may involve exothermic steps
- (D) The secondary process may involve a step which produces the reactant molecule as one of the product
19. The electronic configuration of NO molecule is,



Which of the following species has shortest bond length and maximum bond strength ?

- (A) NO : Bond order = $\frac{1}{2}(8 - 3) = 2.5$
- (B) NO^+ : One electron is removed from $\pi_{2p_x}^*$, bond order = $\frac{1}{2}(8 - 2) = 3.0$
- (C) NO^{+2} : Electrons are removed one each from π_{2p_y} and $\pi_{2p_x}^*$, bond order = $\frac{1}{2}(7 - 2) = 2.5$
- (D) NO^- : one electron is added to $\pi_{2p_x}^*$ molecular orbital bond order = $\frac{1}{2}(8 - 4) = 2$

20. The Hamiltonian for the He atom is :

$$(A) \hat{H} = -\frac{\hbar^2}{2m}(\nabla_1^2 + \nabla_2^2) + \frac{2e^2}{4\pi\epsilon_0}\left(-\frac{1}{r_1} - \frac{1}{r_2}\right) + \frac{e^2}{4\pi\epsilon_0 r_{12}}$$

$$(B) \hat{H} = \frac{\hbar^2}{2m}\nabla^2 + \frac{1}{4\pi\epsilon_0}\left[-\frac{e^2}{r_A} - \frac{e^2}{r_B} + \frac{e^2}{R_{AB}}\right]$$

$$(C) \hat{H} = \frac{\hbar^2}{2m}(\nabla_1^2 + \nabla_2^2) + \frac{1}{4\pi\epsilon_0}\left[-\frac{e^2}{\gamma_{A_1}} - \frac{e^2}{\gamma_{A_2}} - \frac{e^2}{\gamma_{B_1}} - \frac{e^2}{\gamma_{B_2}} + \frac{e^2}{\gamma_{12}} + \frac{e^2}{\gamma_{AB}}\right]$$

$$(D) \hat{H} = \frac{\hbar^2}{2m}(\nabla_1^2 + \nabla_2^2 + \nabla_3^2) + \frac{1}{4\pi\epsilon_0}\left[-\frac{e^2}{\gamma_{A_1}} - \frac{e^2}{\gamma_{A_2}} - \frac{e^2}{\gamma_{A_3}} - \frac{e^2}{\gamma_{B_1}} - \frac{e^2}{\gamma_{B_2}} - \frac{e^2}{\gamma_{B_3}} + \frac{e^2}{\gamma_{12}} + \frac{e^2}{\gamma_{13}} + \frac{e^2}{\gamma_{23}} + \frac{e^2}{\gamma_{AB}}\right]$$

21. The partition function for translation is :

$$(A) q = \frac{(2\pi mkT)^{3/2} \mathcal{V}}{h^3}$$

$$(B) q = \sum g_i e^{-E_i/kT}$$

$$(C) q = \frac{1}{1 - e^{-hv/kT}}$$

$$(D) q = \frac{8\pi^2 I kT}{\sigma h^2} \text{ where } \sigma = \text{symmetry number}$$

where q = partition function of the system.

22. Which of the following is an expression for the most probable distribution of N-particles among the various energy levels according to Maxwell-Boltzmann statistics ?

(A) $n_i = \frac{g_i}{e^{\alpha + \beta \epsilon_i} - 1}$

(B) $n_i = \frac{g_i}{e^{\alpha + \beta \epsilon_i} + 1}$

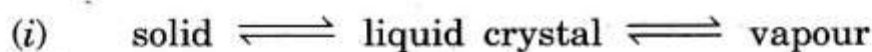
(C) $n_i = \frac{g_i}{e^{\alpha + \beta \epsilon_i}}$

(D) $\frac{g_i}{n_i} + \delta = e^{\alpha + \beta \epsilon_i}$, where δ is an integer greater than one

where $\beta = \frac{1}{kT}$

23. Which of the following statements is with reference to liquid crystal, mesomorphic state ?

(A) There exists two triple points in case of solid showing mesomorphic change according to vapour pressure-temperature diagram

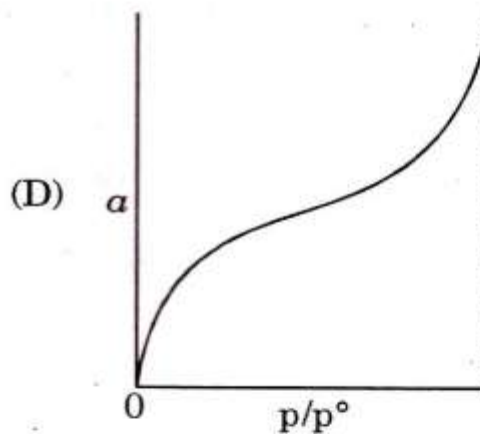
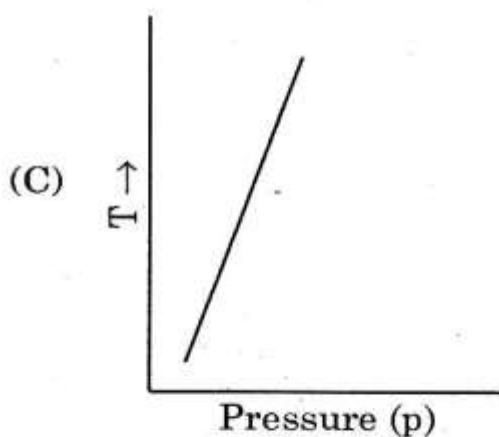
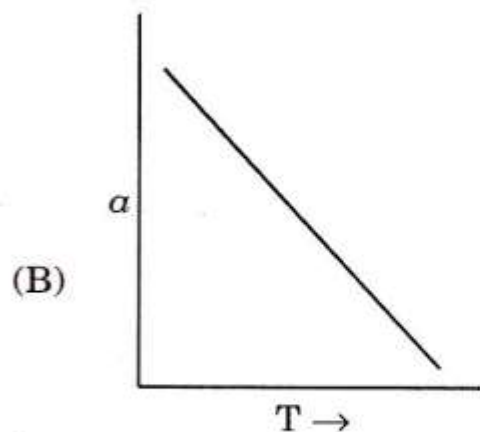
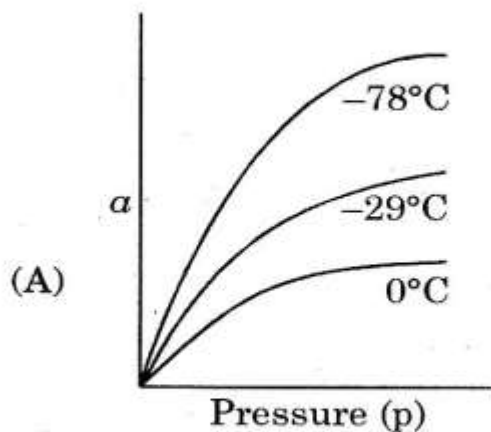


(B) Nematic crystal do not show normal flow behaviour of liquids. The concept of viscosity is not applicable. In polarised light nematic crystals have thread like structure. They are uniaxial and are not affected by magnetic field

(C) Smectic liquid crystals flow in layers as if different planes are sliding over one another. They show X-ray diffraction pattern in one direction only. In polarised light smectic phase appear to have fan like appearance. They are uniaxial and are not affected by magnetic field

(D) Cholesteric liquid crystals have their layer structure but differ in thickness with smectic liquid crystals. They show behaviour of nematic liquid crystals as well. They show characteristics of smectic as well as of nematic liquid crystals

24. Which of the following curve represents Freundlich adsorption isotherm ?



[a = amount of gas adsorbed per gram, T = temperature]

25. An eigen function of the operator $\frac{\partial^2}{\partial x^2}$ is $\psi = e^{2x}$ and the corresponding eigen value is :

(A) 1

(B) 2

(C) 3

(D) 4

26. Which of the following statements is *not* correct ?

(A) The normalised valence bond wave function for hydrogen molecule is

$$\psi_{\text{VB}} = \frac{1}{\sqrt{2}}(\phi_{\text{A}(1)} \cdot \phi_{\text{B}(2)} + \phi_{\text{A}(2)} \cdot \phi_{\text{B}(1)}) \text{ where } \frac{1}{\sqrt{2}} \text{ is a normalising constant}$$

(B) The M.O. wave function for hydrogen molecule is

$$\psi_{\text{M.O}} = \psi_1 \psi_2 \text{ where } \psi_1 = \frac{1}{\sqrt{2}}(\phi_{\text{A}(1)} + \phi_{\text{B}(1)}) \text{ and } \psi_2 = \frac{1}{\sqrt{2}}(\phi_{\text{A}(2)} + \phi_{\text{B}(2)})$$

$$(C) \quad \psi_{\text{M.O}} = \frac{1}{2} \frac{[\phi_{\text{A}(1)} \phi_{\text{A}(2)} + \phi_{\text{B}(1)} \phi_{\text{B}(2)}]}{x} + \frac{1}{2} \frac{[\phi_{\text{A}(1)} \phi_{\text{B}(2)} + \phi_{\text{B}(1)} \phi_{\text{A}(2)}]}{y}$$

(D) In the expression given in (C) the term x represents covalent structure of hydrogen molecule and the term y represents ionic structure of the molecule

27. Which of the following statements is *not* correct ?

(A) Neither optical isomers nor geometrical isomers can be distinguished by mass spectrometry

(B) Copper metal dissolves in KCN with evolution of hydrogen

(C) The crystal field theory is applicable to main group of elements as well where there is no incomplete d -subshell. For empty or completely filled d -subshell, crystal field stabilisation energy is zero

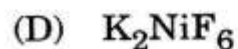
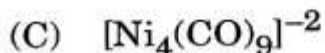
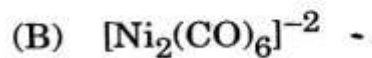
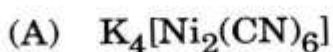
(D) The complex ion $[\text{Cr}(\text{NH}_3)(\text{OH})_2\text{Cl}_3]^{-2}$ exhibit geometrical isomerism. There are three structures. Only one cis- form is there where all groups are cis- to each other. The other structures in which Cl and OH are trans and the other in which Cl-trans and OH-cis

28. Which of the following is only unambiguously pure nitrosyl compound $[M(NO)_n$ type] ?
- (A) $Fe(NO)_4$ (B) $Co(NO)_3$
 (C) $Cr(NO)_4$ (D) $Ru(NO)_4$
29. Which of the following reactions takes place by outer sphere mechanism ?
- (A) $[Fe^{II}(CN)_6]^{-4} + [Ir^{IV}Cl_6]^{-2} \rightarrow [Fe^{III}(CN)_6]^{-3} + [Ir^{III}Cl_6]^{-3}$
 (B) $[Co(NH_3)_5X]^{+2} + Cr^{+2} + 5H^+ \rightarrow [Cr(H_2O)_5X]^{+2} + Co^{+2}(aq.) + 5NH_4^+$
 [where $X = F^-, Cl^-, SO_4^{2-}, NCS, CH_3COO^-$ etc.]
 (C) $Cis-[Ru(NH_3)_4Cl_2]^+ + Cr^{+2}(aq.) \rightarrow Cis-[Ru(NH_3)_4(H_2O)Cl]^+ + CrCl_2^{2+}$
 (D) $Co(EDTA)^{-2} + [Fe(CN)_6]^{-3} \rightarrow Co(EDTA)^{-} + [Fe(CN)_6]^{-4}$
30. Which of the following statements is *not* correct with regard to π -acceptor ligands ?
- (A) π -acceptor ligands orbitals accept electron density from filled metal orbitals to form a type of π -bonding that supplements the σ -bonding arising from lone pair donation of the ligand. The high electron density on the metal atom can be delocalised on to the ligand
 (B) The ligand forms bond to the metal by using σ -orbital and exercise their π -acidity by using π -orbitals whose nodal planes include the axis of σ -bond
 (C) The metal atom has high positive oxidation state. The metal atom lies out of the molecular plane of the ligand
 (D) The ability of the ligand to accept electron density into low lying empty π -orbitals is called π -acidity (the word acidity is used in Lewis sense)

31. Which of the following statements is *not* correct ?

- (A) $\text{Be}(\text{C}_5\text{H}_5)_2$ has unsymmetrical sandwich structure in which Be atom oscillates between two positions. Since Be radius is so small that even at the closest distance of approach of the two C_5H_5 rings the Be atom cannot make good bonds to both simultaneously
- (B) Ferrocene has sandwich structure and has the aromatic sextet of π -electrons. The preferred rotational orientation of the rings in a $(\eta^5\text{-C}_5\text{H}_5)_2\text{M}$ compound is staggered and not eclipsed. The barrier to rotation is very high. The staggered configuration is almost certain. It does not undergo Friedel-Craft acylation reaction, sulphonation reaction
- (C) $\text{PtCl}_2 \cdot \text{C}_2\text{H}_4$ is a dimer with chlorine bridges. The plane of the olefine and C = C axis are perpendicular to one of the expected bond direction from the central metal atom. The expected line of a bond orbital from the metal strikes the C = C bond at its mid point
- (D) The compound $(\eta^5\text{-C}_5\text{H}_5)_2\text{TiCl}_2$ is readily made from TiCl_4 by the action of $\text{C}_5\text{H}_5\text{Na}$. It has distorted tetrahedral structure. The compound in presence of Al alkyls acts a catalyst for ethene or propene polymerisation

32. In which of the following compounds nickel has +1 oxidation state ?



33. Which of the following statements is *not* correct ?

- (A) The crystal field theory treats the interaction between the metal ion and the ligands as purely electrostatic in which the ligand atoms are represented as point charges or as point dipoles
- (B) The metal ligand interaction can be described in terms of molecular orbital formed by overlap of ligand and metal orbitals
- (C) Both Crystal Field Theory (CFT) and Molecular Orbital Theory (MOT) make explicit and rigorous use of symmetry properties of the complex. The CFT provides a very simple and easy way of treating numerically many aspects of the electronic structure of complexes. MOT does not provide numerical results in an easy way
- (D) The CFT must become less accurate as delocalisation of ligand electrons and orbitals becomes more important i.e. as covalent bonding increases. However, CFT explains explicitly relative strength of ligands. CFT also provides extensive information regarding excited states in which there is electron or charge transfer occurring

34. Copper and gold form an alloy. The pair of metals have difference in radii about 12.5%. Both have cubic closed packed structure. Both have same valency electrons.

The two metals are completely miscible and forms a/an :

- (A) compound alloy
- (B) substitution alloy
- (C) interstitial alloy
- (D) eutectic alloy

35. Which of the following statements is *not* correct ?

- (A) The primitive cubic unit cell consists of one atom at each of the eight corners. Each atom is shared by 8 unit cells. Thus, primitive cubic unit cell will have $8 \times \frac{1}{8}$ i.e. one atom
- (B) The body centred cubic unit cell consists of 8 atoms at 8 corners and one atom at the centre. At each corner only $\frac{1}{8}$ of the atom is within the unit cell. Thus, there are two atoms in bcc unit cell
- (C) The face centred cubic unit cell has 6 faces and each face is shared by two unit cells. The contribution of 6 face centred atoms is equal to $6 \times \frac{1}{2}$ i.e. 3 atoms per unit cell. As before 8 corners of the unit cell contribute one atom to the unit cell. Thus, there are 4 atoms in the FCC unit cell
- (D) In unit cell of diamond lattice there are 8 corners each shared by 8 unit cells. There are 6 faces in the unit cell. As before 3 atoms contribute to the unit cell. Thus, there are total $3 + 1 = 4$ atoms of carbon in a unit cell of diamond lattice

36. Which of the following statements is *not* correct ?

- (A) Living organisms require 27 elements including 15 metals, out of which Na, K, Ca and Mg are in minor quantities, Mn, Fe, Co, Cu, Zn and Mo in trace quantities, and V, Cr, Sn, Ni and Al in major quantity
- (B) Sodium ions are major constituent of extracellular fluid of animals and human being known to activate certain enzymes in our body. Excess Na^+ is harmful and may cause hypertension.

Potassium ion is essential to all organisms. It is a major constituent of intracellular fluid. Transfer of Na^+ from the intracellular fluid to the extracellular fluid with the help of carrier protein is a biological process which goes on in each and every cell. $\text{Na}^+ - \text{K}^+$ pump maintains the volume of the cell

- (C) Mg^{+2} are concentrated more in intracellular fluid than extracellular fluid. It is a necessary requirement for the activation of phosphate transfer enzyme which participate in energy releasing biochemical process. Mg^{+2} is also a requirement for carbohydrate mechanism. Ca^{+2} are normally maintained at low concentration about 1000 times less in intracellular fluid than in extracellular fluid. The concentration is maintained by biological process. Ca^{+2} are important in bones and teeth as $\text{Ca}_3(\text{PO}_4)_2$

- (D) Crown-4, Crown-5 and Crown-6 are selective for Li^+ , Na^+ , K^+ respectively. It is possible to get complexes with unusual coordination number 10. Cyclic polyethers can have varying sizes of ring for eg. benzo-12-crown-4 has a ring of 12 atoms four of which are oxygen atoms.

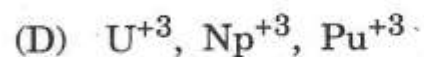
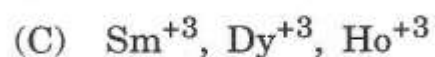
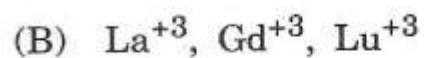
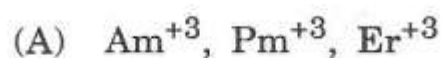
Crystals are also isolated. The crypt is the molecule of the type $\text{N}[\text{CH}_2\text{CH}_2\text{OCH}_2\text{CH}_2\text{OCH}_2\text{CH}_2]_3\text{N}$. Which can wrap round and hide cation

37. Which of the following statements is *not* correct ?

- (A) Haemoglobin is made up of four subunits. Each unit comprises of porphyrin complex haem which contains Fe^{+2} bonded to four nitrogen atoms and a globular protein called globin. The globular protein is coordinated to Fe^{+2} in haem through a fifth nitrogen atom from a histidine molecule in the protein. The sixth position round Fe^{+2} is occupied either by dioxygen or a water molecule
- (B) In oxyhaemoglobin Fe^{+2} is in low spin state and is diamagnetic. It fits in the hole at the centre of the porphyrin ring. In deoxyhaemoglobin Fe^{+2} is in the high spin state and is paramagnetic. The size of Fe^{+2} increases from 0.61 to 0.78 Å. Fe^{+2} is too large to fit in the hole and it is 0.7 – 0.8 Å above the ring. The presence of oxygen changes the electronic arrangement of Fe^{+2} and also distorts the shape of the complex
- (C) The globular protein may not be essential since in the absence of it oxidation of Fe^{+2} to Fe^{+3} occurs which is also reversible
- (D) The subunit of haemoglobin picks up oxygen the Fe^{+2} contracts and moves into the plane of the ring and in doing so it moves the histidine molecule attached to it and causes conformational changes in the globin chain. The chain is hydrogen bonded to the other three units, it changes their conformation too and enhances their ability to attract O_2

38. Which of the following is solvolytic reaction in non-aqueous medium ?
- (A) $\text{SOCl}_2 + [(\text{CH}_3)_4\text{N}]_2\text{SO}_3 \rightarrow 2(\text{CH}_3)_4\text{NCl} + 2\text{SO}_2$
solvent
- (B) $\text{SnCl}_4 + 2\text{SeOCl}_2 \rightarrow 2\text{SeOCl}^+ + \text{SnCl}_6^{-2}$
solvent
- (C) $\text{NO}^+[\text{AlCl}_4^-] + (\text{CH}_3)_4\text{N}^+\text{Cl}^- \rightarrow (\text{CH}_3)_4\text{N}^+[\text{AlCl}_4^-] + \text{NOCl}$
solvent
- (D) $2\text{HSO}_3\text{F} + \text{SbF}_5 \rightleftharpoons \frac{\text{H}_2\text{SO}_3\text{F}^+ + [\text{SbF}_5(\text{OSO}_2\text{F})]^-}{\text{Strongest acid}}$
solvent
39. Alkali metal dissolves in liquid ammonia to give blue solution. Which of the following statements is *not* correct ?
- (A) The blue colour of the solution is independent of the metal dissolved in liquid NH_3 . The bright blue colour is due to short wavelength tail near 1450 nm of a broad and intense absorption band in infrared region
- (B) The visible region spectra of solutions of all the metal ion are the same, the colour must be due to a common species, solvated electrons
- (C) Very dilute solutions are paramagnetic. As the solutions are made more concentrated the paramagnetism decreases with the increase in concentration of the metal ion. The g value is very close to that of free electron
- (D) As the solution becomes more concentrated the molar conductivity increases regularly until a saturated (bronze colour) solution is reached. The solution is paramagnetic. Lattice energy and solubility data show that the standard free energies for solvation for alkali metals are more negative than in water

40. Which of the following triads of trivalent ions of *f*-block elements is pink in colour ?



41. Which of the following statements is *not* correct ?

(A) The $5f$ -orbitals extend far into space beyond $6s$ and $6p$ orbitals and participate in bonding whereas $4f$ -orbitals are buried deep inside the atom, totally shielded by outer orbitals and unable to participate in bonding

(B) Some of the lanthanides and actinides are coloured. This is due to f - f transition and occurs in visible region. The absorption bands are quite sharp unlike for d -block elements

(C) The magnetic moment in lanthanides is mainly due spin contribution and orbital contribution is not very significant. The magnetic moment in such a case is given by the relation $\mu = g\sqrt{S(S+1)}$, where S is the total spin quantum number of electrons in the ground state

(D) The value of g for free gaseous atom is given by the relation

$$g = 1 + \frac{J(J+1) + S(S+1) - L(L+1)}{2J(J+1)}$$

For a free electron the value of g is 2.0023.

42. Which of the following statements is *not* correct ?

(A) The +2 oxidation state in actinides is confined to Am, Cf, Es, Fm, Md and No. This can be associated with the greater energy of promotion $5f \rightarrow 6d$ than of promotion $4f \rightarrow 5d$. The +2 oxidation state is more stable at the end of series. No^{+2} and Md^{+2} are most stable.

The +2 oxidation state all lanthanides can be prepared and stabilised. The +2 oxidation state is well established for both solution and solid compound of Sm, Eu and Yb.

(B) Eu^{+3} , Sm^{+3} and Yb^{+3} do not yield divalent ion by reduction with Zn or sodium amalgam. However all three can be obtained by electrolytic in aqueous solution.

Sm^{+2} and Yb^{+2} are quite rapidly oxidised by water as well as air. Eu^{+2} in solution has been much studied in order to compare electron transfer mechanism with those of other one electron reducing agent.

(C) Eu^{+2} reduces V^{+3} more slowly than does Cr^{+2} , but Eu^{+2} and Cr^{+2} do not reduce ClO_4^- , although weaker reductant V^{+2} does so.

(D) The blue solution of Sm^{+2} , Eu^{+2} and Yb^{+2} in liquid ammonia reacts with 2, 2'-bipy or 1, 10-phen to form compounds of the type $\text{M}^{+2} (\text{bipy})_2$ ($\text{phen})_2$

43. Which of the following statements is *not* correct ?

- (A) The +7 oxidation state exists in Np and Pu. The oxidation state +7 was confirmed by Mössbauer spectra where isomer shifts has been correlated with the numebr of 5*f* electrons present. The oxides PuO₂ and Li₂O are exposed to O₂ at 430°C, the resulting Li₃PuO₆ gives a green unstable aqueous solution. Similar behaviour was seen Re^{VII} and Tc^{VII}.
- (B) The +5 oxidation state is the normal oxidation state for Pa (actinides) and there is quite close resemblance to the chemistry of Nb and Ta. The dioxo ion, MO₂⁺, formation is of importance for U, Np, Pu and Am chemistry.
- (C) The radius of La⁺³ is about 0.18Å larger than that of Y⁺³, so that if 14 lanthanide elements did not intervene one might have expected Hf⁺⁴ to have a radius ~ 0.2Å greater than Zr⁺⁴. Instead of shrinkage of about 0.21Å almost exactly wipes out the expected increase and results in almost identical radii for Hf⁺⁴ and Zr⁺⁴.

The shielding of one 4*f* electron by another is very imperfect owing to the shapes of orbitals so that at each increase the effective nuclear charge experienced by each of the 4*f* electron increases causing the reduction of the size of the entire 4*f*^{*n*} shell. The accumulation of these successive contraction is called lanthanide contraction.

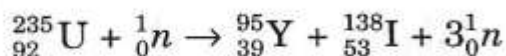
(D) There is no actinide contraction unlike lanthanide contraction.

44. Which of the following radioactive decay series is *not* naturally occurring series ?

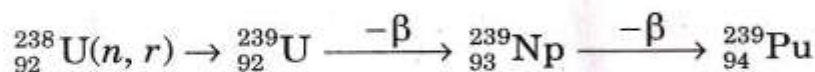
- | | |
|----------------------|---------------------|
| (A) Neptunium series | (B) Thorium series |
| (C) Uranium series | (D) Actinium series |

45. Which of the following statements is *not* correct ?

- (A) In a thermal reactor neutrons from ^{235}U lose most of their kinetic energy by passage through a moderator and then undergo nuclear reactions and lot of energy is released



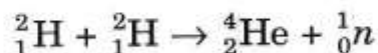
(fission can continue with neutrons so produced)



(The reaction leads to the production of transuranic elements)

The neutron concentration is controlled by using steel rods containing a high concentration of boron.

- (B) In a fast reactor high energy neutrons are used with graphite as moderator to bring about fission of ^{235}U in a highly enriched uranium fuel, even more effectively ^{239}Pu can be used as fissile top and if mixed with ^{238}U , the action of some of the neutrons produced on the latter isotope regenerates ^{239}Pu . The neutron concentration is controlled by using steel or cadmium rods as in thermal reactors to capture the neutron
- (C) Fusion reactions leading to the formation of He from hydrogen, deuterium (${}^2_1\text{H}$), tritium (${}^3_1\text{H}$) are in principle also capable of generating immense amount of energy. Compared with fission reactions they have the advantage that large amount of strongly radioactive nuclides are not obtained as by-products
- (D) The activation energies for fusion reactions are very high. It has been possible to produce a fusion reaction.



(Fission bomb is used to supply the necessary activation energy).

This is the principle underlying hydrogen or thermonuclear bomb.

46. Which of the following examples can exhibit facial and meridional isomers in coordination compounds ?
- (A) $[\text{Co}(\text{NH}_3)_5\text{Br}]\text{SO}_4$ (B) $[\text{Co}(\text{NH}_3)_5\text{NO}_2]\text{Cl}_2$
(C) $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]^+$ (D) $\text{Co}(\text{NH}_3)_3(\text{NO}_2)_3$

47. Identify the lanthanide complex in which the central metal ion has the highest oxidation state and highest coordination number :

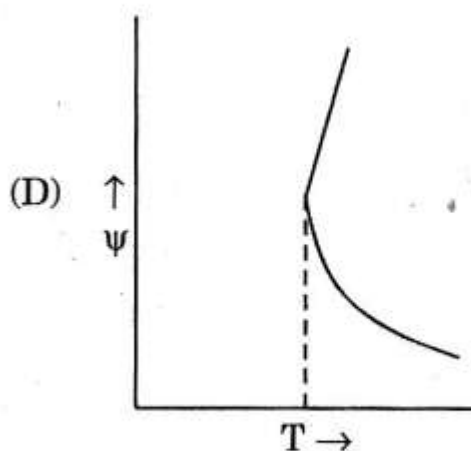
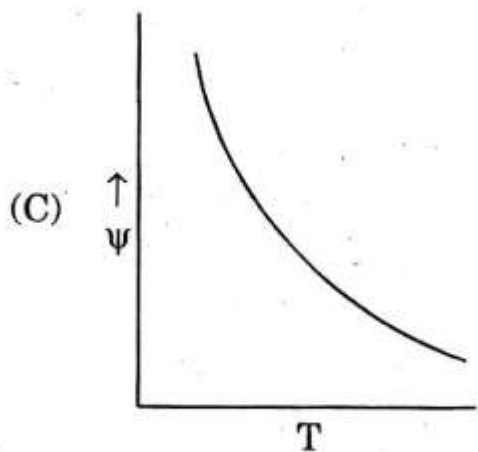
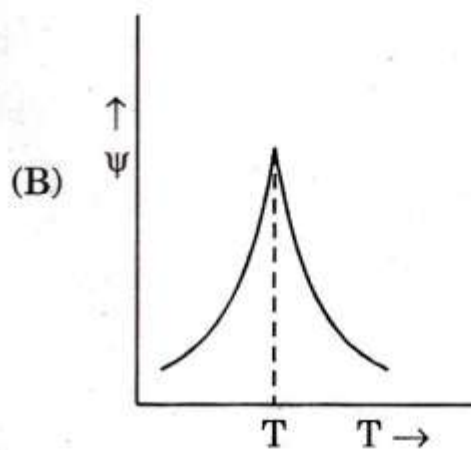
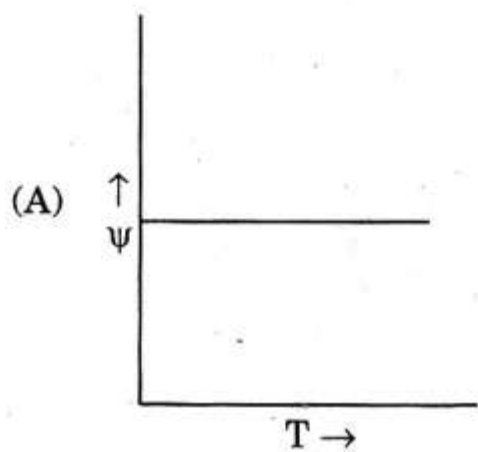
- (A) $(\text{NH}_4)_2 \text{Ce}(\text{NO}_3)_6$ (B) $\text{Ce}(\text{NO}_3)_4 (\text{OPh}_3)_2$
(C) $[\text{Er}(\text{NCS})_6]^{-3}$ (D) $\text{La}(\text{ac ac})_3 (\text{H}_2\text{O})_2$

48. Which of the following statements is *not* correct ?

The stability of the metal complexes in general are greatly influenced by several factors such as polarity, polarisability, ionisation energy, bond angles steric hindrance and solvent. In general their individual influences are as :

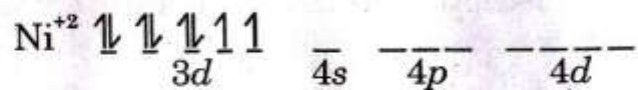
- (A) Due to greater electrostatic interaction between metal ion and ligand, polarity and polarisability of the ligand results in higher stability of the metal complex. The basicity of the ligand is correlated with proton association constant
- (B) As the complex formation involve the covalent bond formation, solvent with low dipole moment and low dielectric constant increase the stability of the complex. Strongly donor solvents decrease the stability of the complex
- (C) The metal ion is larger than carbon and bond angles in octahedral complex are nearer 90° than the tetrahedral angle $109^\circ.28'$ for carbon, the five membered chelate ring becomes the stablest ring with saturated ligands. The resonance effects involving d -orbital of the metal and π -orbital electrons in the ligand favour six membered chelate ring for stability
- (D) The decreasing size of the metal ion decreases the stability of the metal complex. The decrease of charge on the metal ion increases the stability of the metal complex. The ions of high polarisability and higher ionisation energy of metallic species decrease the stability of the metal complex

49. Which of the following diagrams represent qualitatively temperature dependence of molar susceptibility (ψ_M) for anti-ferromagnetic behaviour of substances ?



50. Which of the following statements is *not* correct ?

- (A) The nickel (II) has electronic configuration $1s^2, 2s^2 2p^6, 3s^2 3p^6 3d^8$. All octahedral complexes of Ni^{+2} must be outer orbital complex :



- (B) Mn^{+2} forms a complex with Br^- . Its paramagnetism indicates five unpaired electrons. $[MnBr_4]^{-2}$ forms a square planar complex
- (C) A knowledge of magnetic susceptibility is necessary for a correct assignment of the electronic configuration. $K_3Co(CN)_6$ is diamagnetic, while K_3CoF_6 is paramagnetic. The central metal ion has d^2sp^3 hybridisation in the former case while it has sp^3d^2 hybridisation in the latter complex according to valence bond theory.
- (D) The maximum number of unpaired electrons which a high spin complex of the first transition series could possess in ground state, is five for example Mn(II) and Fe(III)

51. Which of the following statements is *not* correct ?

- (A) The term symbol for the ground state of N atom is ${}^4S_{3/2}$
- (B) The term symbol for $2^2P_{5/2}$ state does not exist
- (C) The ground state term symbol of $3d^5$ of Mn^{+2} is $6s$
- (D) The term symbol for the ground state of sodium is $3^2P_{1/2}$

52. Which of the following statements is *not* correct with regard to esr spectral studies ?

(A) When metal ion is placed in a crystalline field the degeneracy of the d -orbital will be resolved by electrostatic interaction. The spin degeneracy will remain until a magnetic field is applied

(B) When the species contain more than one unpaired electron the spin degeneracy can also be resolved by the crystal field i.e. the spin levels may be split even in the absence of magnetic field called zero field splitting.

When the species contain odd number of unpaired electrons the spin degeneracy of every level remains doubly degenerate called Kramer's degeneracy

For an even number, two unpaired electrons the spin degeneracy may be removed completely by the crystal field

(C) In the absence of zero field splitting the two possible transitions $0 \rightarrow +1, -1 \rightarrow 0$ ($\Delta m_s = \pm 1$) are degenerate and only one signal is observed in spectrum. Zero field splitting removes the degeneracy in m_s . When subsequent splitting by the applied field occurs the two resulting transitions are not degenerate. Thus two peaks are observed in the spectrum when zero field splitting exists but only one when it is absent.

(D) The esr is extremely sensitive and can detect even every small amount of paramagnetic material. The free radical chemistry can be studied through esr. The diamagnetic S_8 ring is cleaved to produce high molecular weight S_x chains which have unpaired electron at each end

The Guoy's balance can be used to detect very low concentration of the species and gives better results than esr in the above studies. Relatively higher concentration is required in esr studies

53. Which of the following statements is *not* correct ?

(A) The magnetic moment of an electron is about -9270×10^{24} compared to $+14.1 \times 10^{24}$ ergs/gauss, the magnetic moment of a proton

(B) For a magnetic field of 10,00 gauss the required frequency for an esr transition when $g = 2.0$ is about 28000 mc/s compared to about 40 mc/s for ^1H -nmr transition

ESR transitions occur at frequencies ~ 9000 mc/s in microwave region at usually employed magnetic field 3200 gauss compared to frequencies in radiofrequency region for nmr

(C) The selection rule for :

esr transition $\Delta m_s = 0$ and $\Delta m_I = \pm 1$

nmr transition $\Delta m_s = \pm 1$ and $\Delta m_I = 0$

(D) Small distortion which goes undetected by X-ray method can sometimes be determined by esr from inequality of the g value

54. Which of the following statements with regard to nmr spectral studies is *not* correct ?

A paramagnetic shift in ^1H nmr signal i.e. towards lower magnetic field is caused by :

- (A) increasing in electronegativity (electron withdrawing effect) of a substituent
- (B) going from $-\text{CH}_3$ proton to $-\text{CH}_2$ proton and $\begin{array}{c} \diagup \\ \text{C} \\ \diagdown \end{array} - \text{H}$ proton
- (C) placing a proton (1) above the plane of C_6H_5 group (2) above the plane of a carbonyl group or olefinic bond (3) above a C—C or C—O single bond (4) in line with acetylenic bond
- (D) increasing hydrogen bonding to a proton

55. Which of the following statements is *not* correct with regard to nmr spectral studies ?

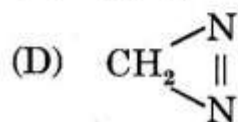
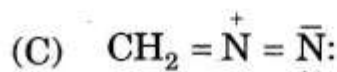
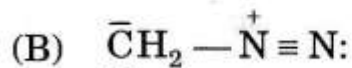
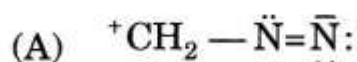
In quantum mechanical terms the nuclear spin number I determines the number of orientations a nucleus may assume in an external uniform magnetic field in accordance with the formula $(2I + 1)$ i.e. two orientations since for a proton $I = 1/2$.

- (A) Equivalent protons give a sharp single peak regardless how strongly they are coupled to each other
- (B) The multiplicity of peaks in the band arising from a group of equivalent protons is determined by the number of equivalent protons and not by the number of neighbouring protons
- (C) The peaks are symmetrically arranged about the chemical shift of the group and are separated from each other by the coupling constant (J)
- (D) In a nmr spectrum a symmetrical sharp ringing signal at extreme right (higher magnetic field than almost all organic protons) is usually that of tetramethyl silane ($\text{Si}(\text{CH}_3)_4$), TMS taken reference as zero cps

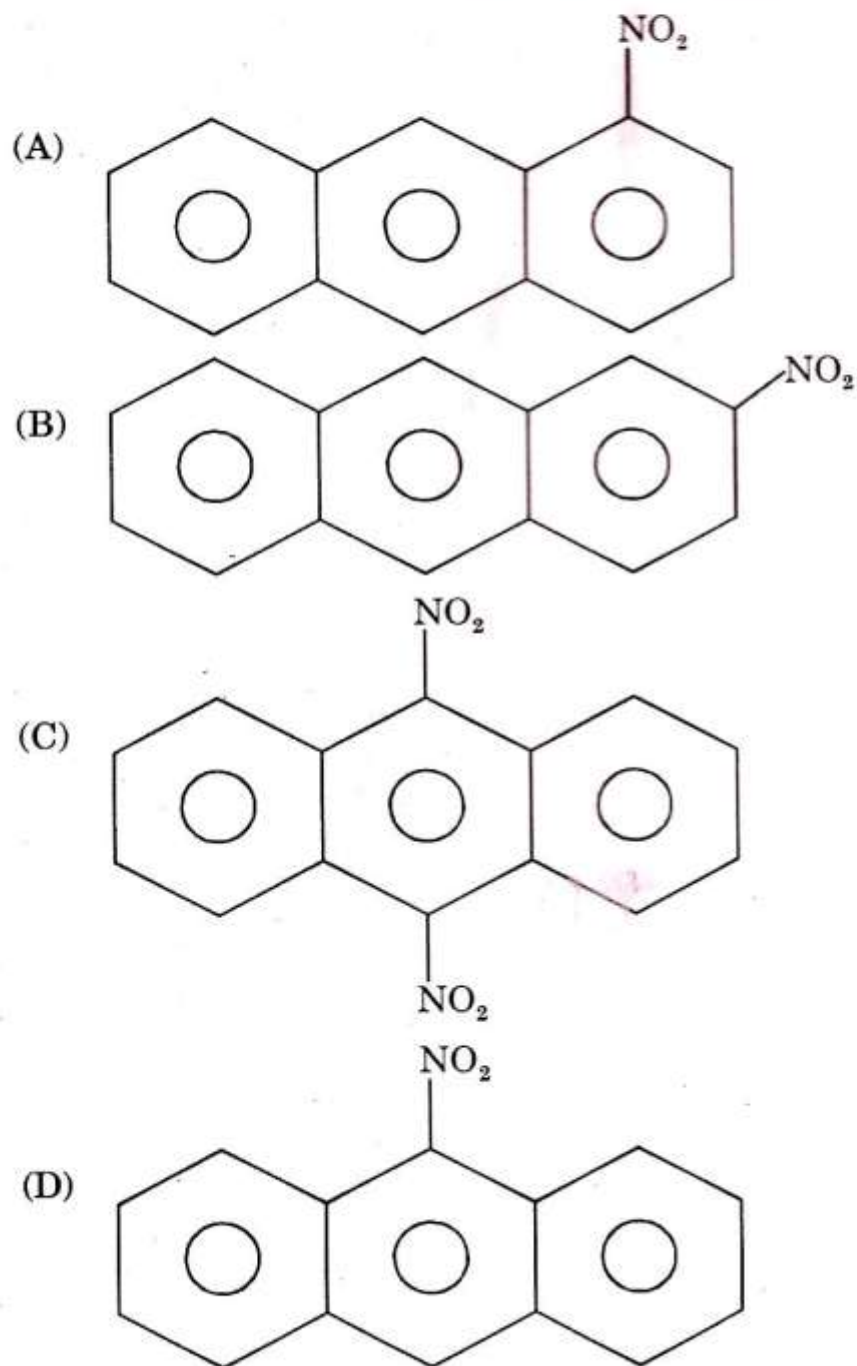
56. Which of the following statements is *not correct* with regard to UV spectral studies ?

- (A) The extended conjugated provides much less stabilisation of the excited state as compared with the ground state and a concomitant blue shift
- (B) The extent of conjugation may be limited sometimes by the geometry of the molecule. This will result in a family of compounds which shows constant λ_{\max} . When more chromophores are added which do not extend conjugation but t_{\max} increases by increments characteristics of the chromophore
- (C) In many compounds in which two or more chromophores of differing polarisability occur in the same molecule but insulated from one another. Two absorption bands are sometimes observed
- (D) Steric inhibition effects result in destabilisation of the excited state brought about by the decreased ability of the conjugated system to attain a coplanar configuration. The ortho effect of substituents is well known and is seen in spectroscopic results

57. Which of the following structures of diazomethane has not been accepted on the basis of IR/electron diffraction studies ?



58. Which of the following is a raw material for preparing a polyamide Nylon-6 ?
- (A) hexamethylene and decanoic acid
 - (B) *w*-aminodecanoic acid
 - (C) caprolactam
 - (D) hexamethylene diamine and adipic acid
59. Which of the following compounds is obtained by the action of a mixture of nitric acid and acetic anhydride with anthracene ?



60. Which of the following alkaloids does *not* belong to opium family ?

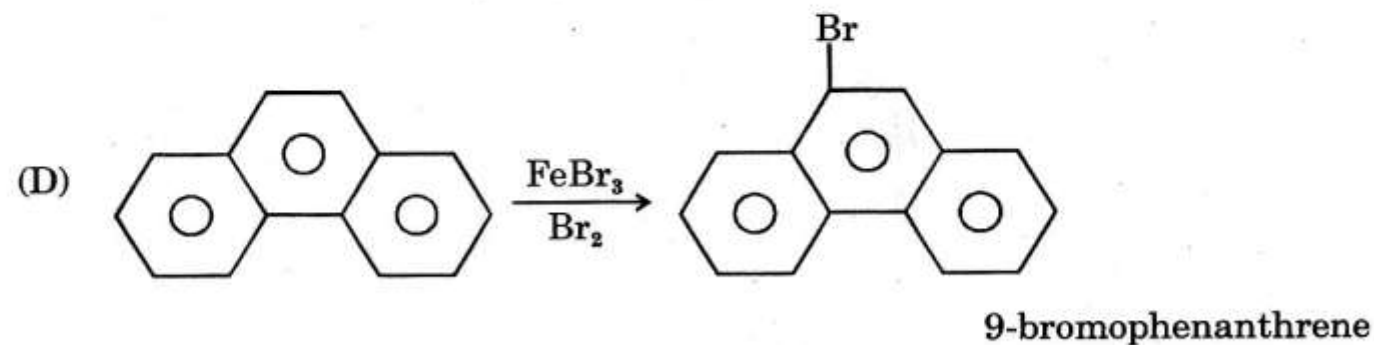
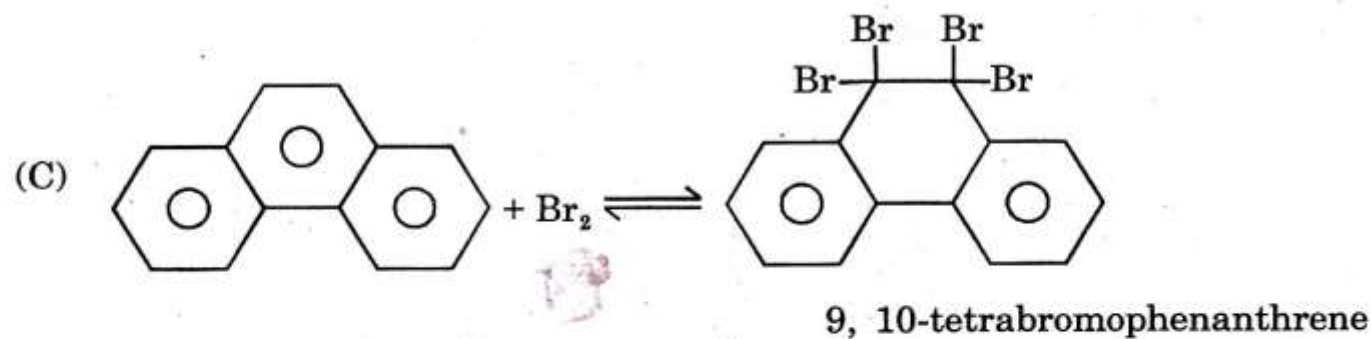
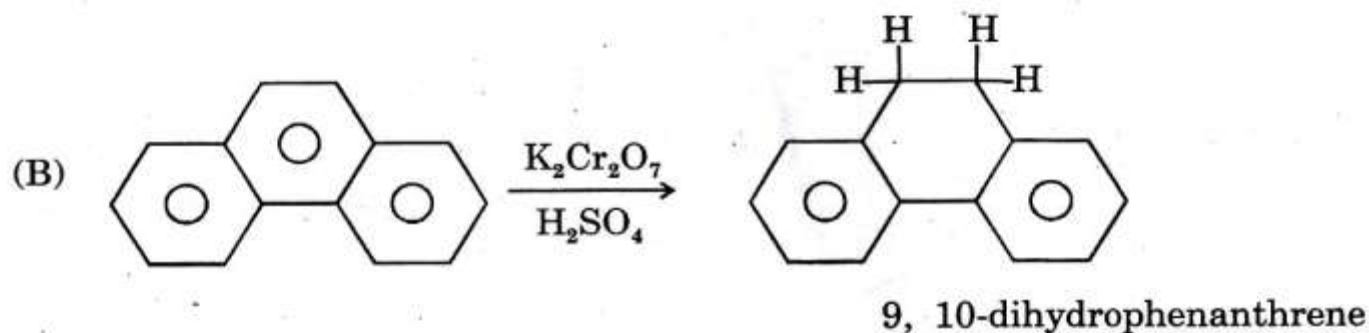
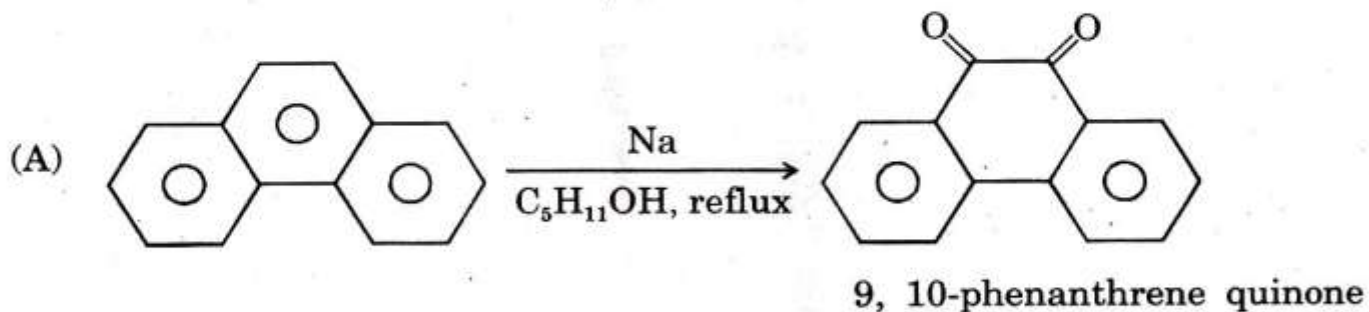
(A) papaverine

(B) quinine

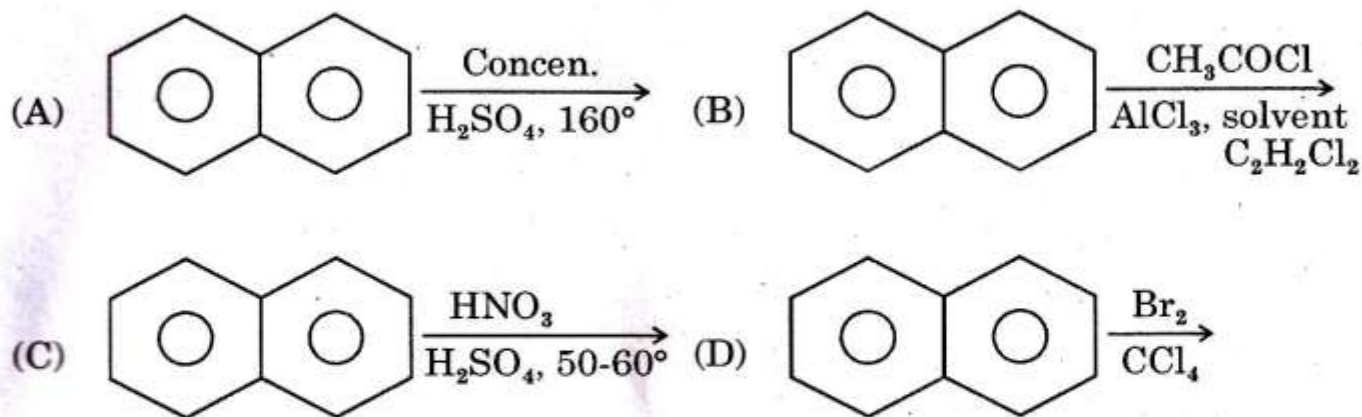
(C) narcotine

(D) morphine

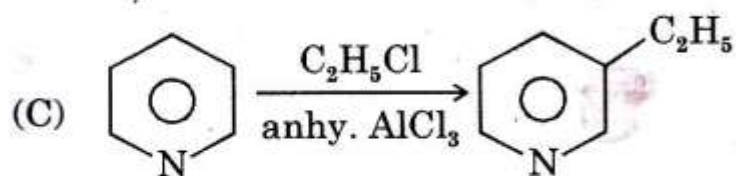
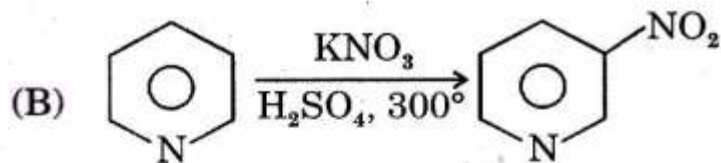
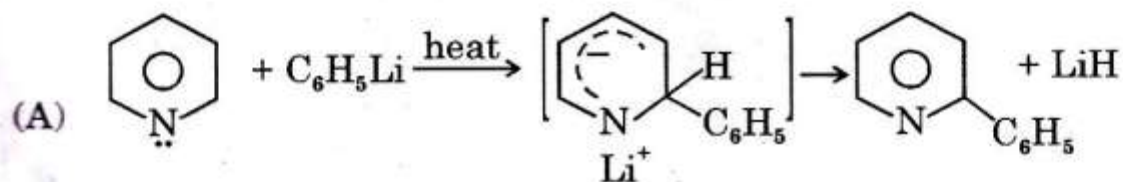
61. In which of the following reactions of phenanthrene correct product is obtained ?



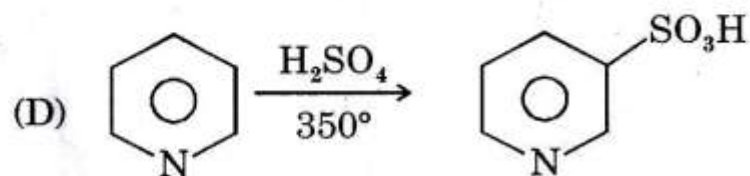
62. Which of the following reactions of naphthalene gives chiefly a β -substituted product ?



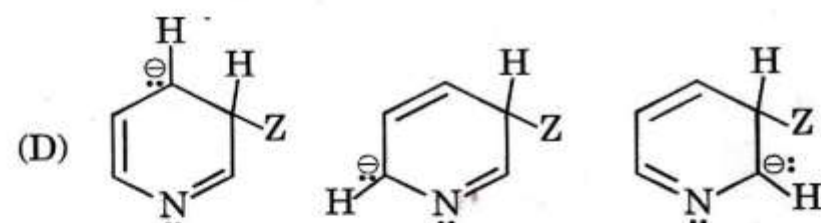
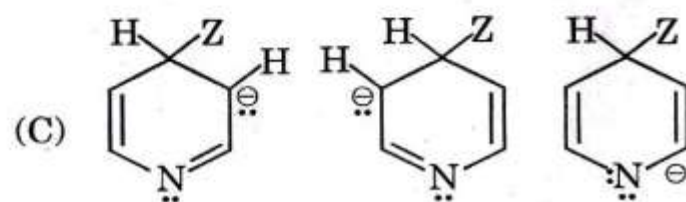
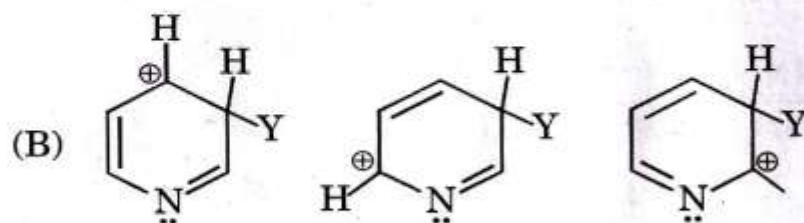
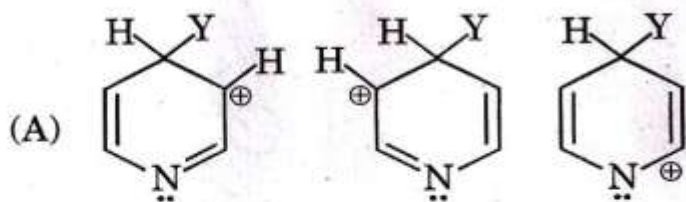
63. Which of the following reactions of pyridine is *not* correct ?



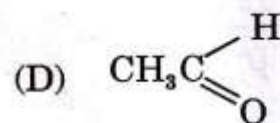
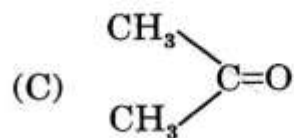
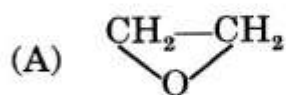
Friedel-Craft reaction



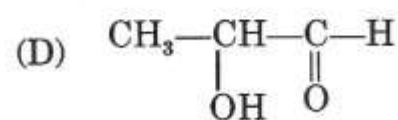
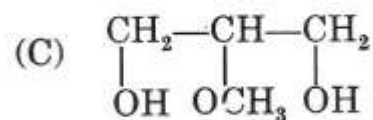
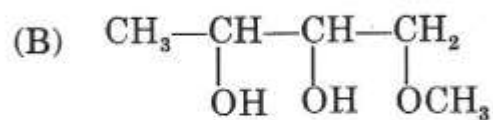
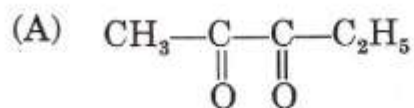
64. Which group of the following structures of pyridine has one structure which is highly unstable ?



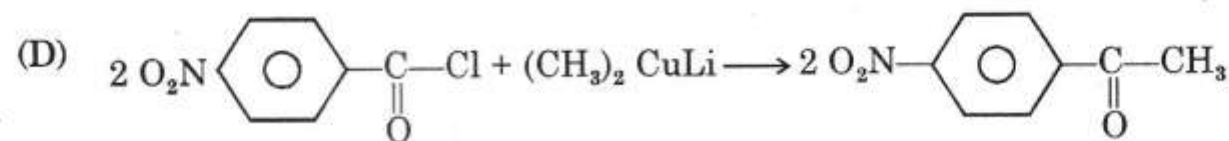
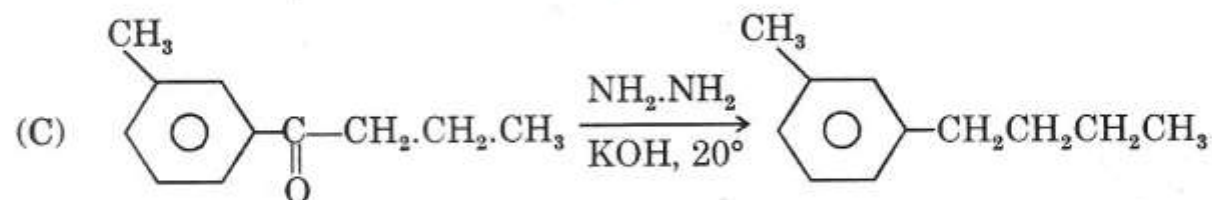
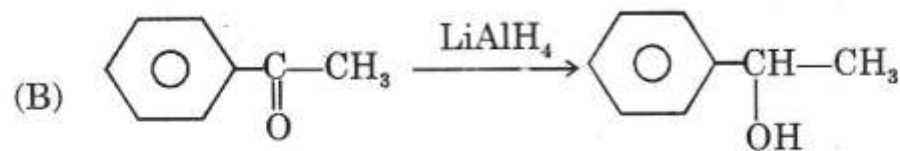
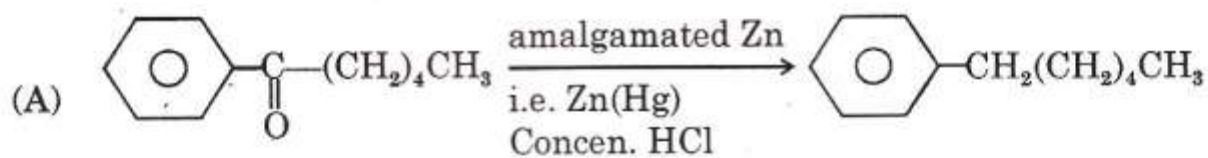
65. Which of the following compounds react with Grignard reagent (CH_3MgI) and hydrolysing the product so obtained under appropriate conditions given methyl ethyl ketone ?



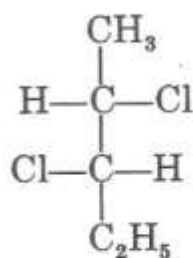
66. Which of the following compounds *does not* react with HIO_4 ?



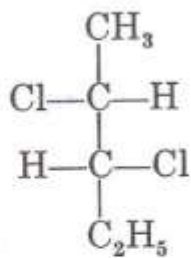
67. Which one of the following is an example of Clemmensen's reduction ?



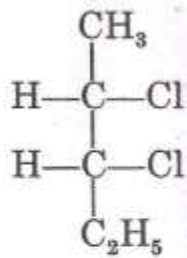
68. The compound 2, 3-dichlorophentane has the following structures ?



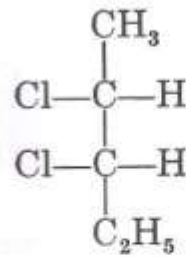
I



II



III



IV

Which of the following statements is *not* correct ?

- (A) Compounds I and II are enantiomers. Similarly compounds III and IV constitute a pair of another enantiomers
- (B) Compound III is a diastereomer of I and of II. Similarly compound IV is a diastereomer of I and of II
- (C) Compound I has (2S, 3S) configuration whereas compound II has (2R, 3R) configuration
- (D) Compound III has (2R, 3S) configuration whereas compound IV has (2S, 3R) configuration

69. Which of the following statements is *not* correct ?

- (A) A pair of diastereomeric aldoses that differ in configuration about C-2 are called epimers
- (B) When ketohexoses for eg. fructose is treated with phenyl hydrazine it yields an osazone which is identical with the osazone prepared from glucose or mannose. These have identical configuration about C-3, C-4 and C-5
- (C) D-(+)-glucose forms two isomeric methyl-D-glucosides. These monomethyl derivatives neither undergo mutarotation nor reduce Tollen's or Fehling's reagent
- (D) D-(+)-glucose has cyclic structure and it has one more chiral centre than in Fischer's open chain structure. α -D-(+)-glucose and β -D-(+)-glucose are two diastereomers differing in configuration about C-2 and are called epimers. They do not undergo mutarotation

70. Which of the following statements provides a direction for the preparation of gluconic acid from glucose ?

(A) Bromine water oxidises aldoses but not ketohexoses, as an acidic reagent, it does not cause isomerisation of the molecule. It is used to synthesis the aldonic acid (monocarboxylic acid) from an aldose. It can be used to differentiate an aldose from a ketose

(B) Fehling's or Tollen's reagent cannot be used for the preparation of aldonic acid from aldoses. Both are alkaline reagent, treatment of sugars with alkali cause extensive isomerisation and even decomposition of the chain. Benedicts solution behaves in a manner similar to Fehling's solution

(C) Treatment of an aldose with more vigorous oxidizing agent HNO_3 brings about an oxidation of $-\text{CHO}$ and CH_2OH group leads to the formation of saccharic acid (dicarboxylic acid) while fructose gives glycollic and tartaric acids

(D) Carbohydrates undergo cleavage by per iodic acid

71. Which of the following compounds has greater stability of carbanion ?



diethyl malonate $\text{p}K_a \approx 15$



acetyl acetone $\text{p}K_a = 8.8$

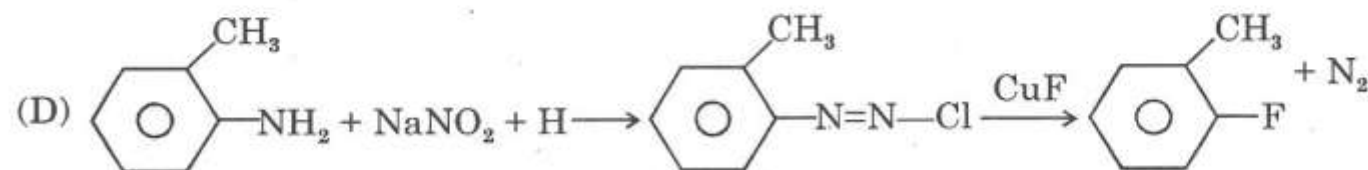
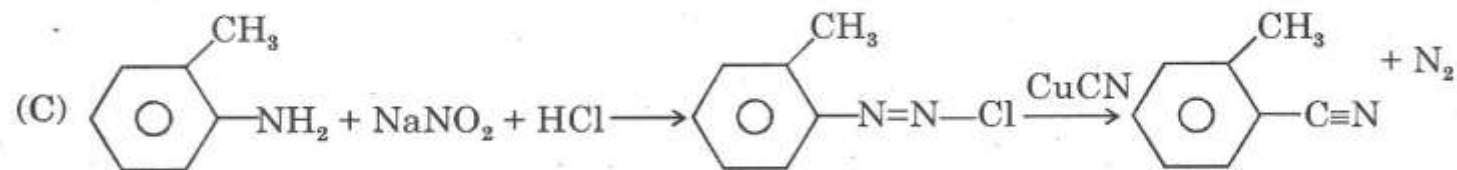
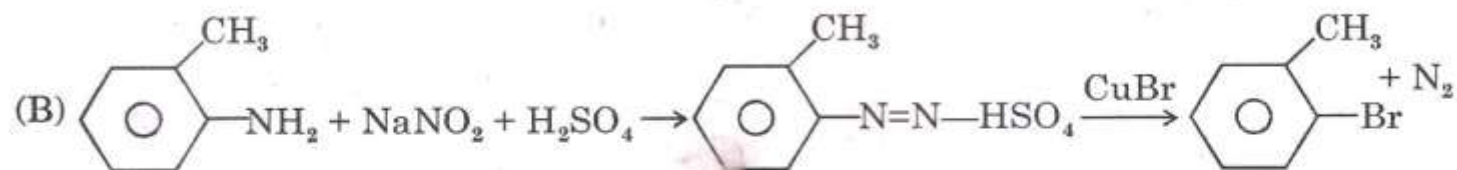
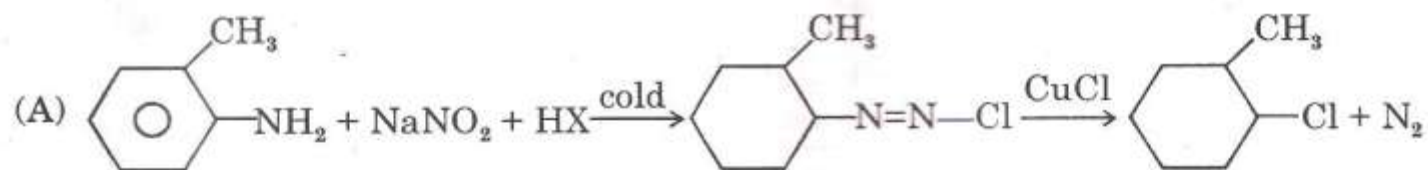


ethyl acetoacetate $\text{p}K_a = 10.1$

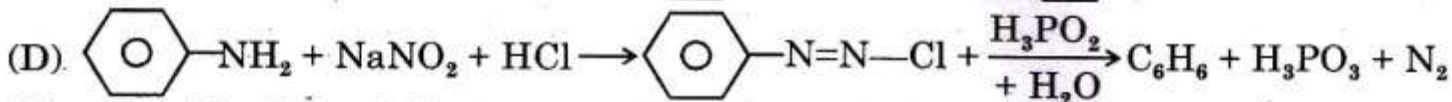
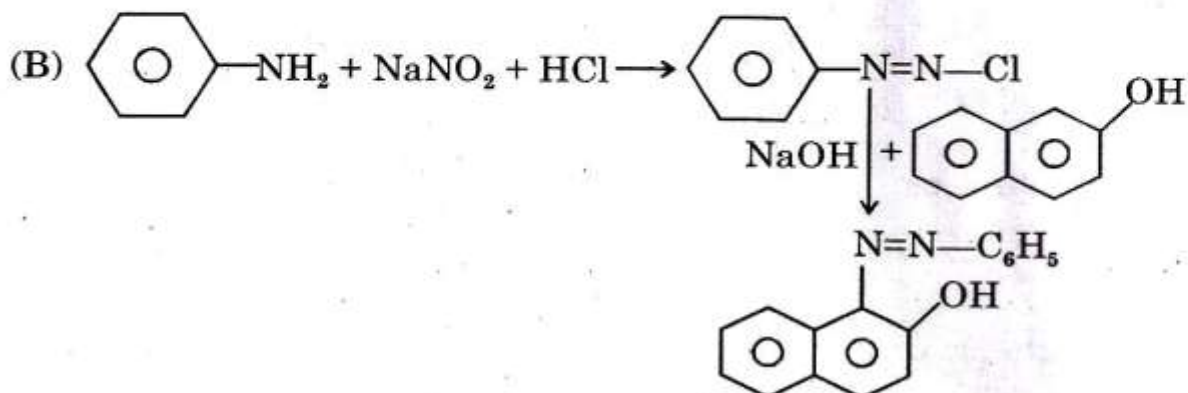
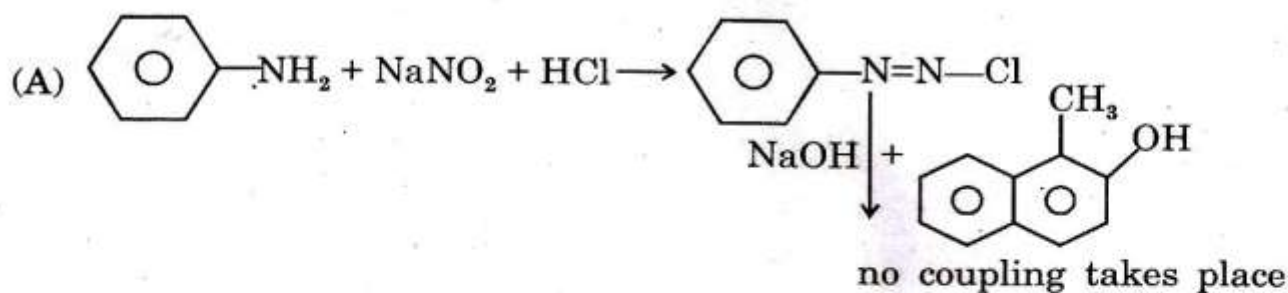


triphenyl methane $\text{p}K_a \approx 25.0$

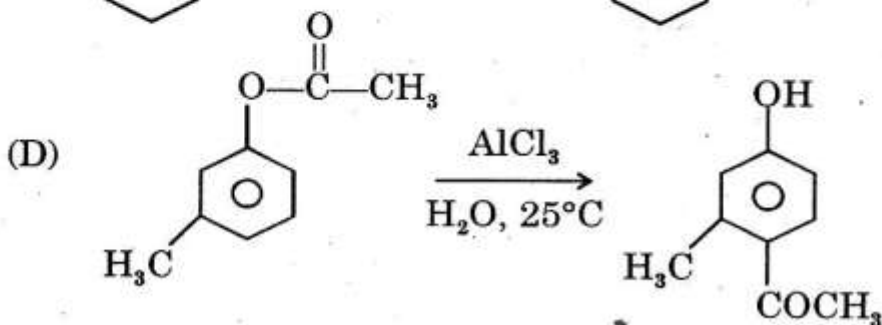
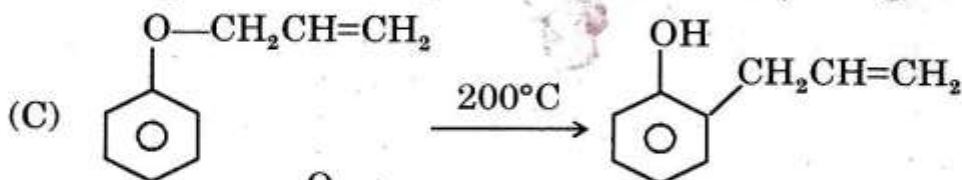
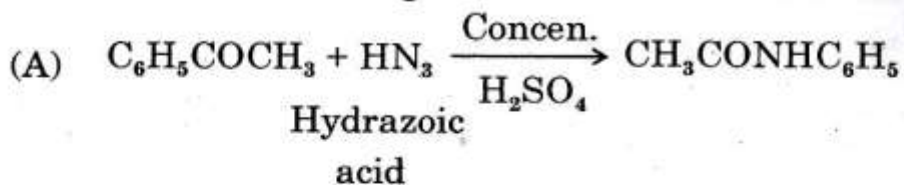
72. Which of the following reactions of diazonium chloride does not take place (Sandmeyer's reaction) ?



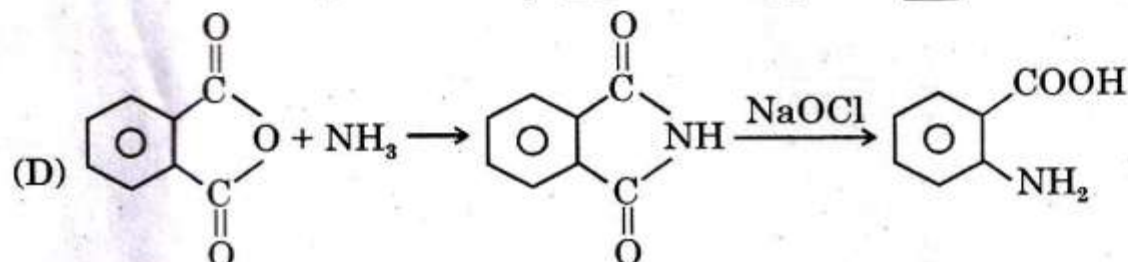
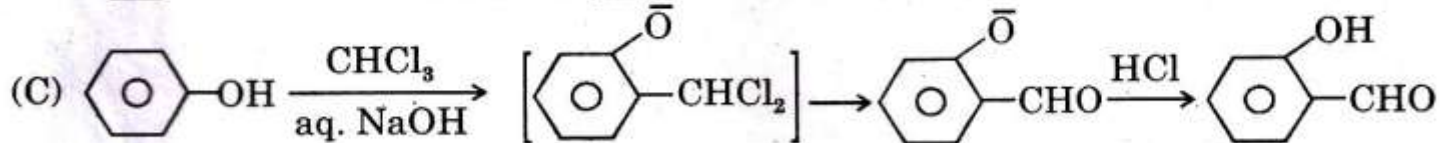
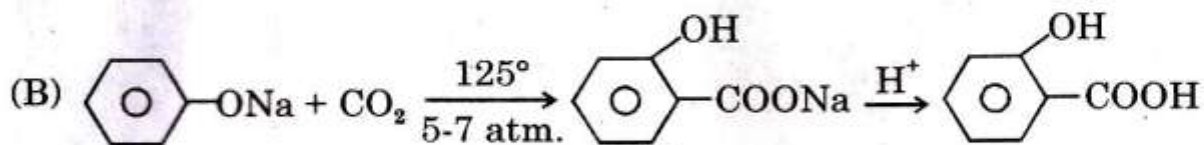
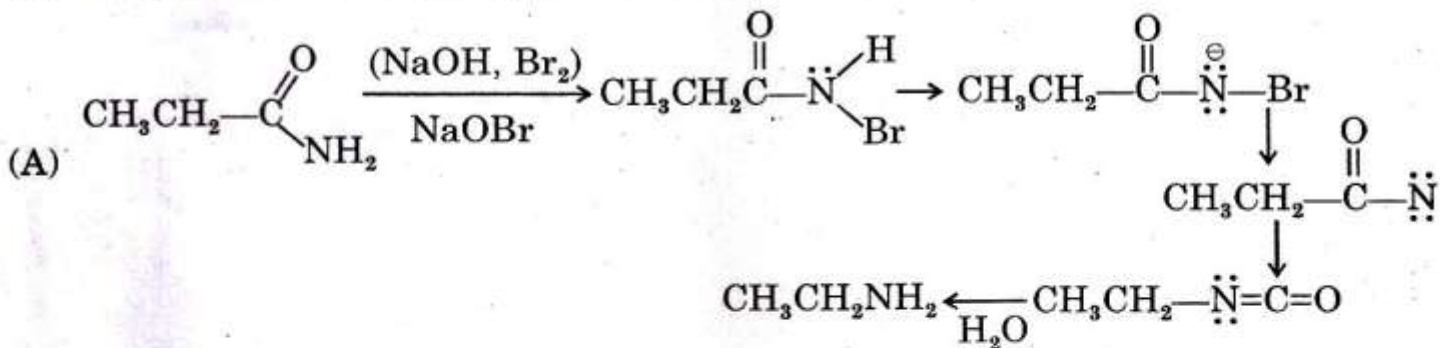
73. Which of the following reactions of diazonium chloride does not take place ?



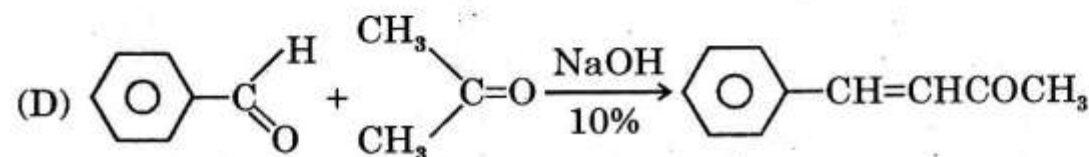
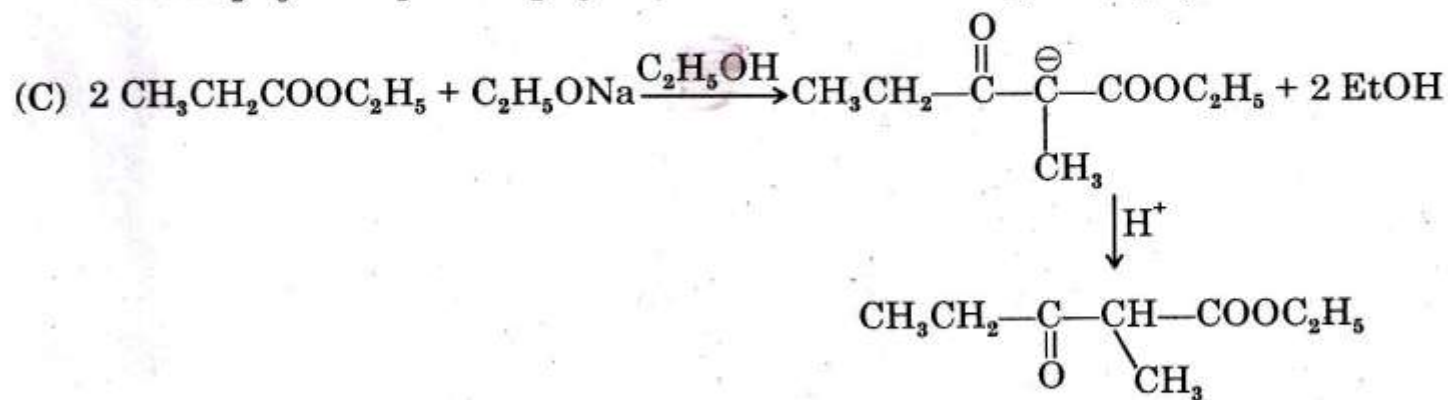
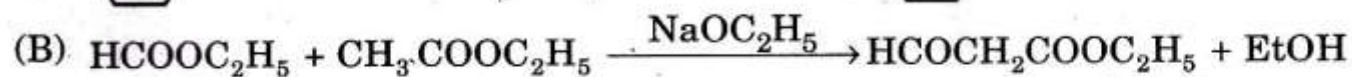
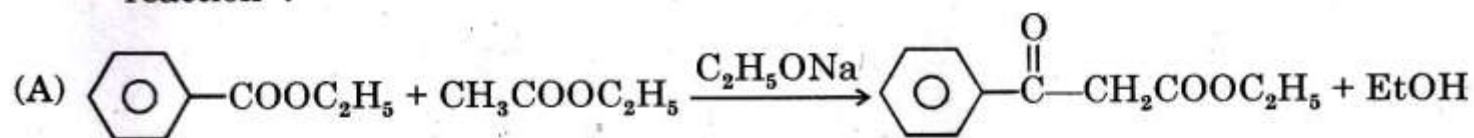
74. Which of the following reactions shows Fries rearrangement ?



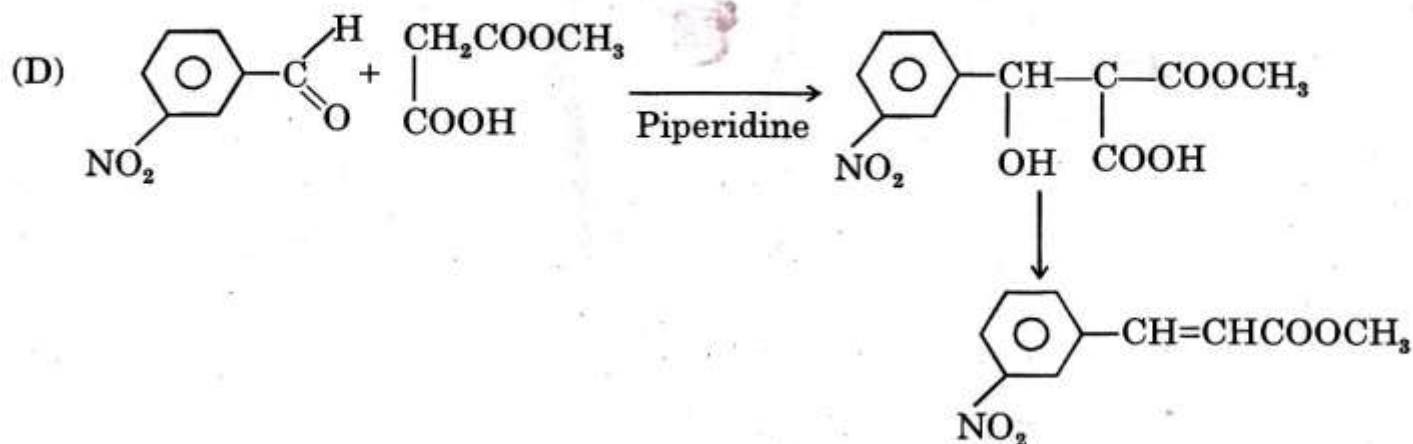
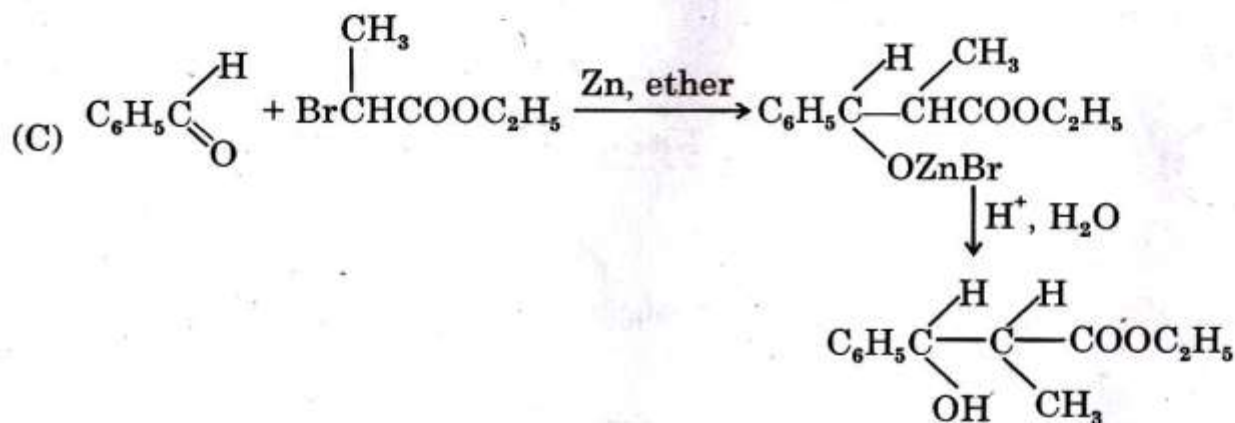
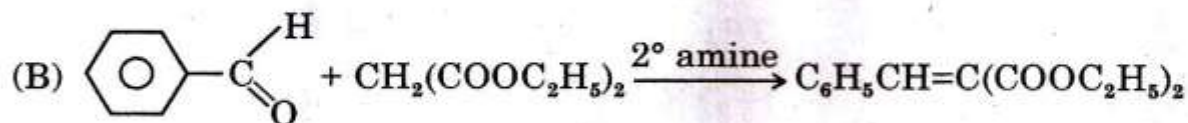
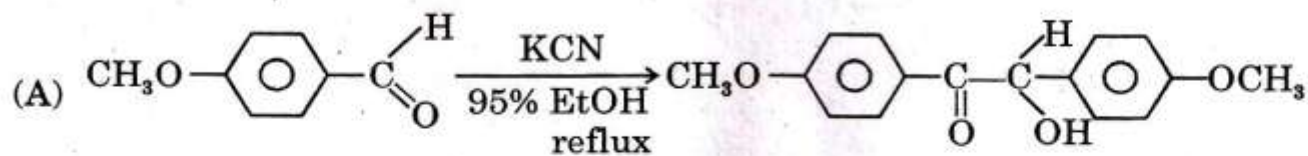
75. Which of the following is an example of Kolbe's reaction ?



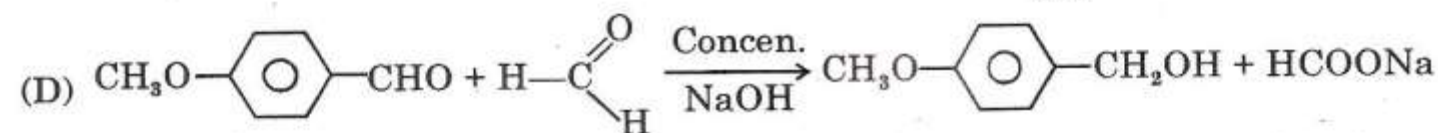
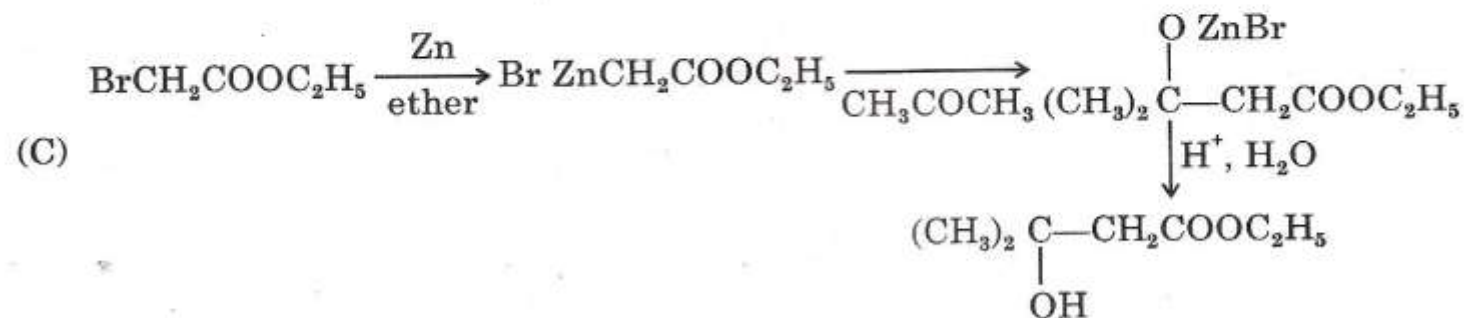
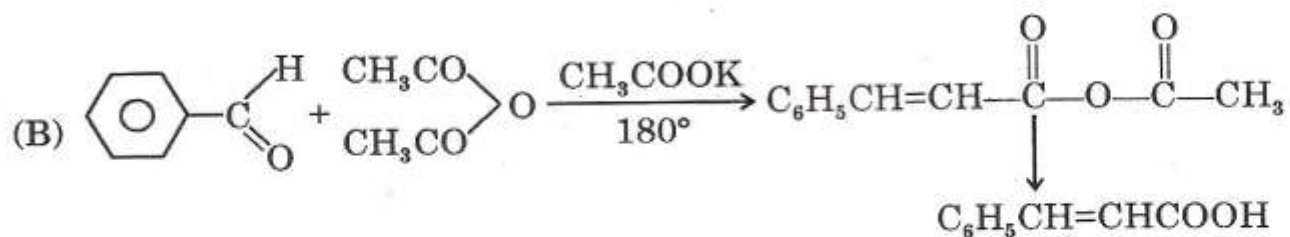
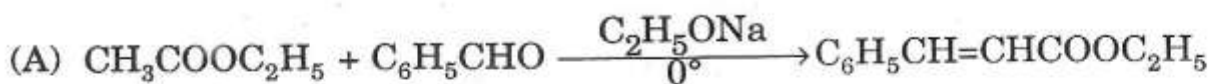
76. Which of the following is an example of Claisen ester condensation reaction ?



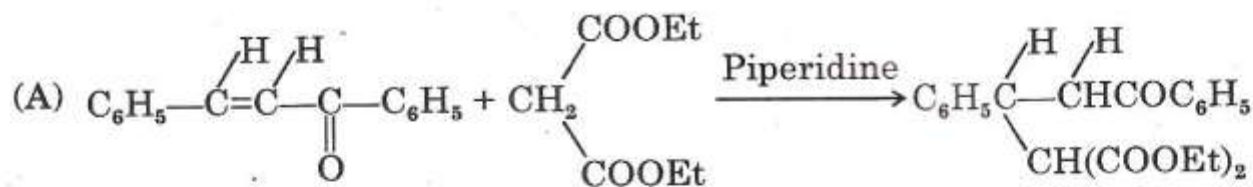
77. Which of the following is an example of Benzoin condensation reaction ?



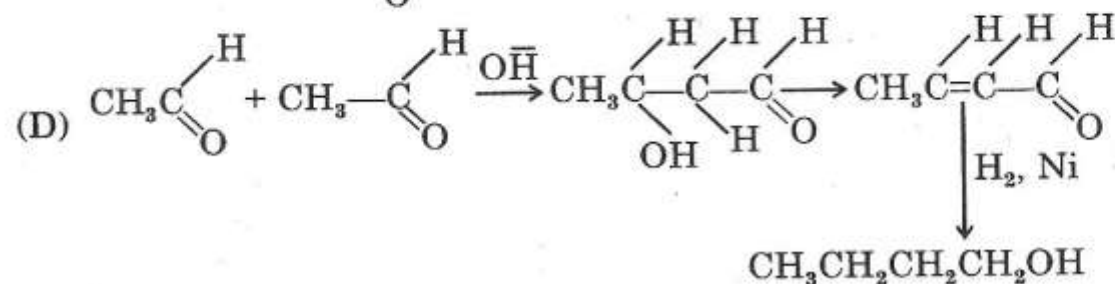
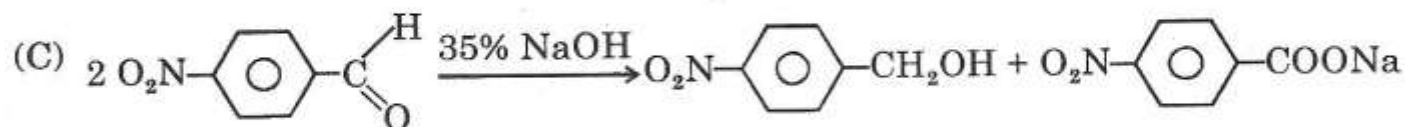
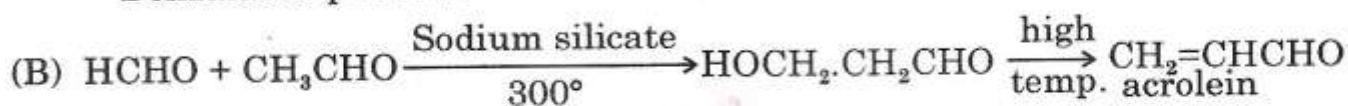
78. Which of the following is an example of crossed Cannizzaro's reaction ?



79. Which of the following is an example of Michael addition reaction ?



Benzalacetophenone



80. Which of the following pair of disaccharides gives one common monosaccharide on hydrolysis by the same enzyme ?
- (A) Sucrose and maltose (B) Sucrose and cellobiose
(C) Lactose and cellobiose (D) Lactose and maltose
81. What is the total areas of H.P. ?
- (A) 34370 sq. km (B) 42987 sq. km
(C) 55693 sq. km (D) 62322 sq. km
82. In which District of H.P. is Chaderkup lake ?
- (A) Lahul-Spiti (B) Shimla
(C) Kullu (D) Chamba
83. Who is the author of *The Antiquities of Kangra* ?
- (A) Dalip K. Chakravarti (B) R.M. Bernier
(C) S.C. Bajpai (D) G.C. Barnes
84. In which month does Mani Mahesh Yatra usually take place ?
- (A) July (B) August
(C) September (D) October

85. In which region of H.P. there are three ways of disposing of a dead body—
Dubant, Bhakhant and Phukant ?
- (A) Chamba (B) Una
(C) Solan (D) Kinnaur
86. Where do the people of Bilaspur District of H.P. usually go to have a holy
dip on the eve of Baishaki ?
- (A) Markanda (B) Shri Naina Devi Ji
(C) Rukmani Kund (D) Haridwar
87. To which caste did the painters of Kangra, Guler and Chamba Kalam mostly
belong ?
- (A) Lohar (ironsmith) (B) Sunar (goldsmith)
(C) Tarkhan (Carpenter) (D) Nai (Barber)
88. What was the decennial growth rate in population in H.P. between 2001 and
2011 ?
- (A) 10.2 percent (B) 12.9 percent
(C) 14.8 percent (D) 15.9 percent

89. In what ratio is expenditure under *Beti Hai Anmol* being shared now between the centre and the H.P. State Government ?
- (A) 70 : 30 (B) 75 : 25
(C) 85 : 15 (D) 90 : 10
90. In how many Districts of H.P. is *Kishori Shakti Yojna* being implemented ?
- (A) Four (B) Six
(C) Eight (D) Ten
91. According to 2011 census what is the rate of male literacy in India ?
- (A) 72.26 (B) 82.14
(C) 85.92 (D) 86.39
92. In which state of India is Wular lake ?
- (A) Odisha (B) Asom
(C) J and K (D) Arunachal Pradesh

93. On which river was a bridge in Raigad District of Maharashtra on Mumbai Goa Highway which washed away in early August 2016 ?
- (A) Mahadei (B) Kaveri
(C) Savitri (D) Sharda
94. For contribution in which field has T.M. Krishna been given Magsaysay Award ?
- (A) Protection of Environment
(B) Struggle for social inclusiveness in culture
(C) Child Rights
(D) Gender Equality
95. Who was the Chairman of 7th Pay Commission ?
- (A) Arun Jaitley (B) Raghuram Rajan
(C) A.K. Mathur (D) Arundhati Bhattacharya
96. What is the motto of Olympic games ?
- (A) Faster, Stronger, Braver (B) Higher, Stronger, Braver
(C) Faster, Higher, Braver (D) Stronger, Faster, Higher

97. Who was Elie Wiesel ?

- (A) Who was in Nazi concentration camp during World War II
- (B) A revolutionary leader of Cuba
- (C) A scientist of Egypt
- (D) None of the above

98. Which day is celebrated in France as Bastille Day ?

- (A) March 14
- (B) July 14
- (C) October 16
- (D) December 10

99. Who is Theresa May ?

- (A) Chancellor of Germany
- (B) Chairperson of IMF
- (C) Chairperson of UN Commission for Refugees
- (D) Prime Minister of U.K.

100. What was the Venue of G-7 Summit held in Japan in May 2016 ?

- (A) Tokyo
- (B) Osaka
- (C) Isle Shima
- (D) Kyoto