

Test Booklet No.

प्रश्नपत्रिका क्र.

F

Paper-II

CHEMICAL SCIENCE

Signature and Name of Invigilator

Seat No.

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(In figures as in Admit Card)

1. (Signature)

(Name)

Seat No.

(In words)

2. (Signature)

(Name)

OMR Sheet No.

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(To be filled by the Candidate)

AUG - 33215

Time Allowed : 1½ Hours]

[Maximum Marks : 100

Number of Pages in this Booklet : 20

Number of Questions in this Booklet : 50

Instructions for the Candidates

- Write your Seat No. and OMR Sheet No. in the space provided on the top of this page.
- This paper consists of **50** objective type questions. Each question will carry *two* marks. *All* questions of Paper-II will be compulsory, covering entire syllabus (including all electives, without options).
- At the commencement of examination, the question booklet will be given to the student. In the first 5 minutes, you are requested to open the booklet and compulsorily examine it as follows :
 - To have access to the Question Booklet, tear off the paper seal on the edge of this cover page. Do not accept a booklet without sticker-seal or open booklet.
 - Tally the number of pages and number of questions in the booklet with the information printed on the cover page. Faulty booklets due to missing pages/questions or questions repeated or not in serial order or any other discrepancy should not be accepted and correct booklet should be obtained from the invigilator within the period of 5 minutes. Afterwards, neither the Question Booklet will be replaced nor any extra time will be given. The same may please be noted.**
 - After this verification is over, the OMR Sheet Number should be entered on this Test Booklet.
- Each question has four alternative responses marked (A), (B), (C) and (D). You have to darken the circle as indicated below on the correct response against each item.
Example : where (C) is the correct response.

(A)	(B)	(C)	(D)
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- Your responses to the items are to be indicated in the **OMR Sheet given inside the Booklet only**. If you mark at any place other than in the circle in the OMR Sheet, it will not be evaluated.
- Read instructions given inside carefully.
- Rough Work is to be done at the end of this booklet.
- If you write your Name, Seat Number, Phone Number or put any mark on any part of the OMR Sheet, except for the space allotted for the relevant entries, which may disclose your identity, or use abusive language or employ any other unfair means, you will render yourself liable to disqualification.
- You have to return original OMR Sheet to the invigilator at the end of the examination compulsorily and must not carry it with you outside the Examination Hall. You are, however, allowed to carry the Test Booklet and duplicate copy of OMR Sheet on conclusion of examination.
- Use only Blue/Black Ball point pen.**
- Use of any calculator or log table, etc., is prohibited.**
- There is no negative marking for incorrect answers.**

विद्यार्थ्यांसाठी महत्वाच्या सूचना

- परिक्षार्थींनी आपला आसन क्रमांक या पृष्ठावरील वरच्या कोपऱ्यात लिहावा. तसेच आपणांस दिलेल्या उत्तरपत्रिकेचा क्रमांक त्याखाली लिहावा.
- सदर प्रश्नपत्रिकेत **50** बहुपर्यायी प्रश्न आहेत. प्रत्येक प्रश्नास **दोन** गुण आहेत. या प्रश्नपत्रिकेतील **सर्व** प्रश्न सोडविणे अनिवार्य आहे. सदरचे प्रश्न हे या विषयाच्या संपूर्ण अभ्यासक्रमावर आधारित आहेत.
- परीक्षा सुरु झाल्यावर विद्यार्थ्यांना प्रश्नपत्रिका दिली जाईल. सुरुवातीच्या 5 मिनीटांमध्ये आपण सदर प्रश्नपत्रिका उघडून खालील बाबी अवश्य तपासून घ्याव्यात.
 - प्रश्नपत्रिका उघडण्यासाठी प्रश्नपत्रिकेवर लावलेले सील उघडावे. सील नसलेली किंवा सील उघडलेली प्रश्नपत्रिका स्विकारू नये.
 - पहिल्या पृष्ठावर नमूद केल्याप्रमाणे प्रश्नपत्रिकेची एकूण पृष्ठे तसेच प्रश्नपत्रिकेतील एकूण प्रश्नांची संख्या पडताळून घ्यावी. पृष्ठे कमी असलेली/कमी प्रश्न असलेली/प्रश्नांचा चुकीचा क्रम असलेली किंवा इतर त्रुटी असलेली सदोष प्रश्नपत्रिका सुरुवातीच्या 5 मिनिटातच पर्यवेक्षकाला परत देऊन दुसरी प्रश्नपत्रिका मागवून घ्यावी. त्यानंतर प्रश्नपत्रिका बदलून मिळणार नाही तसेच वेळही वाढवून मिळणार नाही याची कृपया विद्यार्थ्यांनी नोंद घ्यावी.
 - वरीलप्रमाणे सर्व पडताळून पहिल्यानंतरच प्रश्नपत्रिकेवर ओ.एम.आर. उत्तरपत्रिकेचा नंबर लिहावा.
- प्रत्येक प्रश्नासाठी (A), (B), (C) आणि (D) अशी चार विकल्प उत्तरे दिली आहेत. त्यातील योग्य उत्तराचा रकाना खाली दर्शविल्याप्रमाणे ठळकपणे काळ/निळा करावा.
उदा. : जर (C) हे योग्य उत्तर असेल तर.

(A)	(B)	(C)	(D)
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- या प्रश्नपत्रिकेतील प्रश्नांची उत्तरे **ओ.एम.आर. उत्तरपत्रिकेतच दर्शवावीत**. इतर ठिकाणी लिहीलेली उत्तरे तपासली जाणार नाहीत.
- आत दिलेल्या सूचना काळजीपूर्वक वाचाव्यात.
- प्रश्नपत्रिकेच्या शेवटी जोडलेल्या कोऱ्या पानावरच कच्चे काम करावे.
- जर आपण ओ.एम.आर. वर नमूद केलेल्या ठिकाणा व्यतिरिक्त इतर कोठेही नाव, आसन क्रमांक, फोन नंबर किंवा ओळख पटेल अशी कोणतीही खूण केलेली आढळून आल्यास अथवा असभ्य भाषेचा वापर किंवा इतर गैरमार्गांचा अवलंब केल्यास विद्यार्थ्यांना परीक्षेस अपात्र ठरविण्यात येईल.
- परीक्षा संपल्यानंतर विद्यार्थ्यांनी मूळ ओ.एम.आर. उत्तरपत्रिका पर्यवेक्षकांकडे परत करणे आवश्यक आहे. तथापी, प्रश्नपत्रिका व ओ.एम.आर. उत्तरपत्रिकेची द्वितीय प्रत आपल्याबरोबर नेण्यास विद्यार्थ्यांना परवानगी आहे.
- फक्त निळा किंवा काळा बॉल पेनचाच वापर करावा.**
- कॅलक्युलेटर किंवा लॉग टेबल वापरण्यास परवानगी नाही.**
- चुकीच्या उत्तरासाठी गुण कपात केली जाणार नाही.**

AUG - 33215/II

ROUGH WORK

Chemical Science
Paper II

Time Allowed : 75 Minutes]**[Maximum Marks : 100**

Note : This Paper contains **Fifty (50)** multiple choice questions, each question carrying **Two (2)** marks. Attempt *All* questions.

1. The species in which the central atom uses sp^2 hybrid orbitals in its bonding is :
- (A) PH_3 (B) NH_3
(C) BCl_3 (D) SbH_3
2. Which of the following is a Lewis acid ?
- (A) Br^- (B) Cl^-
(C) S^- (D) Ag^+
3. The strength of hydrogen bonds follow the order :
- (A) $\text{ClH} \dots \text{Cl} > \text{NH} \dots \text{N} > \text{OH} \dots \text{O} > \text{FH} \dots \text{F}$
(B) $\text{ClH} \dots \text{Cl} < \text{NH} \dots \text{N} < \text{OH} \dots \text{O} < \text{FH} \dots \text{F}$
(C) $\text{ClH} \dots \text{Cl} < \text{NH} \dots \text{N} > \text{OH} \dots \text{O} > \text{FH} \dots \text{F}$
(D) $\text{ClH} \dots \text{Cl} < \text{NH} \dots \text{N} < \text{OH} \dots \text{O} > \text{FH} \dots \text{F}$
-

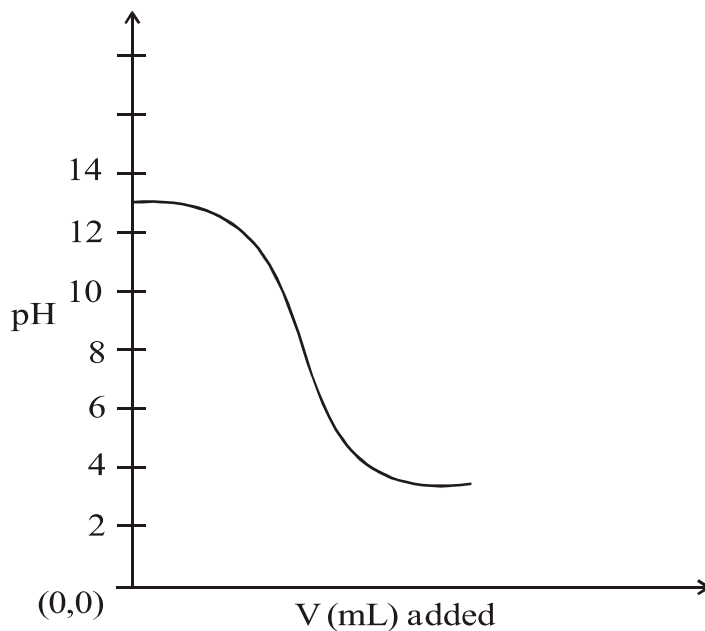
4. A student pipetted out five 25.00 ml samples of HCl solution, transferred each sample to a conical flask, diluted them with distilled water and titrated against NaOH solution, having phenolphthalein indicator. The following burette reading were noted :

SET	Burette reading (mL)
(I)	35.22
(II)	36.14
(III)	36.13
(IV)	36.15
(V)	36.13

Which of the probable explanation for the variations in the results ?

- (A) The burette was not rinsed with the NaOH solution
 (B) Student misread the first set reading
 (C) A different amount of water was added to the first sample
 (D) The pipette was not rinsed with HCl
5. Based on the VSEPR theory, the molecule IF_5 has a shape of :
 (A) Trigonal bipyramid (B) Square pyramid
 (C) Octahedral (D) Pentagonal bipyramid
6. A solution with $\text{pH} = 2$ is more acidic than one with $\text{pH} = 6$ by the factor of :
 (A) 4000 (B) 4
 (C) 8000 (D) 10,000
7. The bond order for NO^+ species is :
 (A) 2 (B) 2.5
 (C) 3 (D) 1.5

8. Which of the following statements describes the following titration curve ?



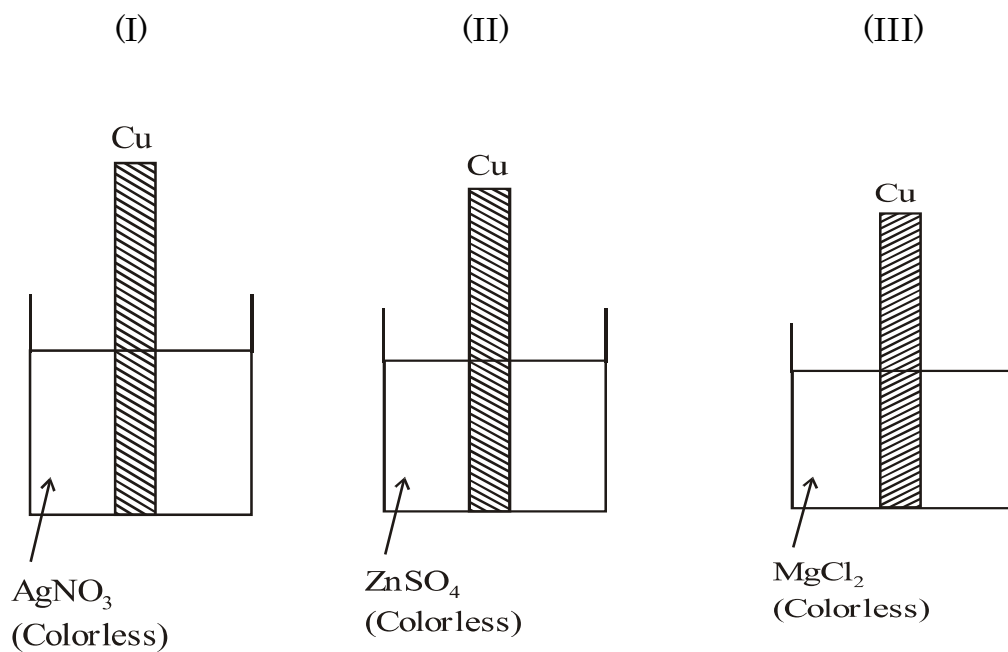
- (A) A strong base is added to a strong acid
- (B) A strong base is added to a weak acid
- (C) A strong acid is added to a strong base
- (D) A strong acid is added to a weak base
9. A gas 'Z' is bubbled through a solution containing 'X' and 'Y'. If the reduction potentials are in the order of $X > Y > Z$, then :
- (A) Y will oxidize X and Z
- (B) Y will oxidize Z but not X
- (C) Y will oxidize both X and Y
- (D) Y will reduce both X and Z

10. The depression of freezing point for 1 M Urea, 1 M glucose and 1 M NaCl are in the ratio :

(A) 1 : 2 : 3 (B) 3 : 2 : 2

(C) 1 : 1 : 2 (D) 1 : 1 : 3

11. Consider the following three set of experiments :

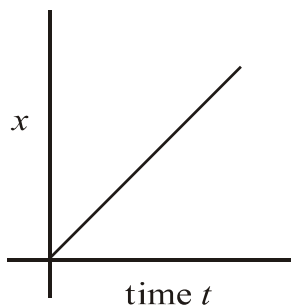


Colorless solution changes to blue colored solution in :

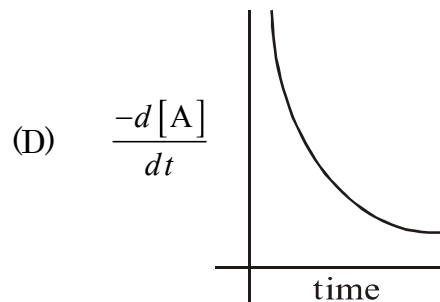
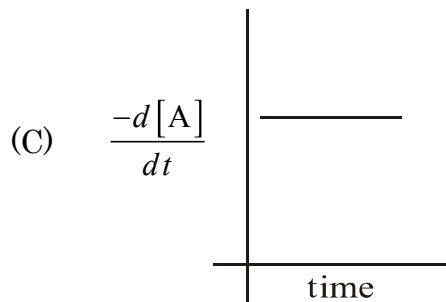
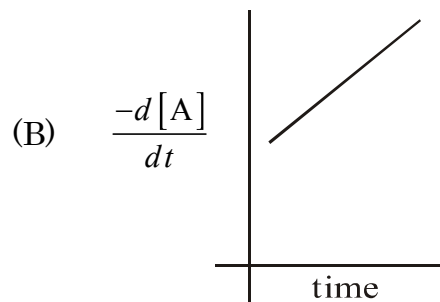
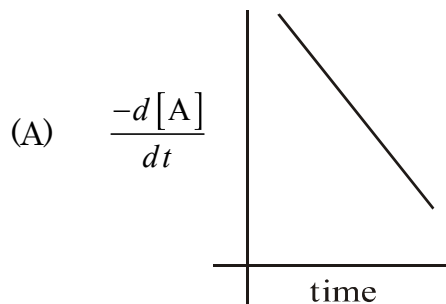
(A) II (B) III

(C) I (D) I and III

12. A graph of concentration of the product (x) as a function of time t for the reaction $A \rightarrow B$ is shown :



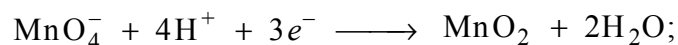
Then which of the following represents the $\frac{-d[A]}{dt}$ Vs. time plot correctly ?



13. Consider the half cell reaction :



For the reaction



E^0 is :

- (A) 1.70 V (B) 5.09 V
- (C) 0.27 V (D) 0.84 V
14. The point group symmetry of cis ML_4X_2 is :
- (A) C_{4v} (B) D_{4h}
- (C) C_{2h} (D) C_{2v}
15. When acidic $\text{K}_2\text{Cr}_2\text{O}_7$ solution is added to Na_2S solution, green Cr^{3+} ions and free S are formed. When same acidic $\text{K}_2\text{Cr}_2\text{O}_7$ solution is added to NaCl solution, no change is noted. Among the substances involved in these reactions which one is the best reducing agent ?
- (A) $\text{K}_2\text{Cr}_2\text{O}_7$ (B) Na_2S
- (C) Cr^{3+} (D) S

16. During the adiabatic process the pressure of a gas is found to be proportional to the cube of its absolute temperature. The value of γ for the gas is :

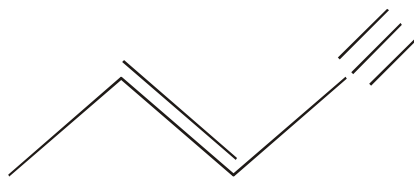
(A) $\frac{3}{2}$

(B) $\frac{7}{2}$

(C) $\frac{5}{3}$

(D) $\frac{9}{7}$

17. The *correct* IUPAC nomenclature for the following compound is :



- (A) (E) Pent-2-en-4-yne (B) (E) Pent-1-yne-3-ene
- (C) (E) Pent-4-yne-2-ene (D) (E) Pent-3-en-1-yne
18. The number of stereoisomers in (2S, 3R) tartaric acid are :

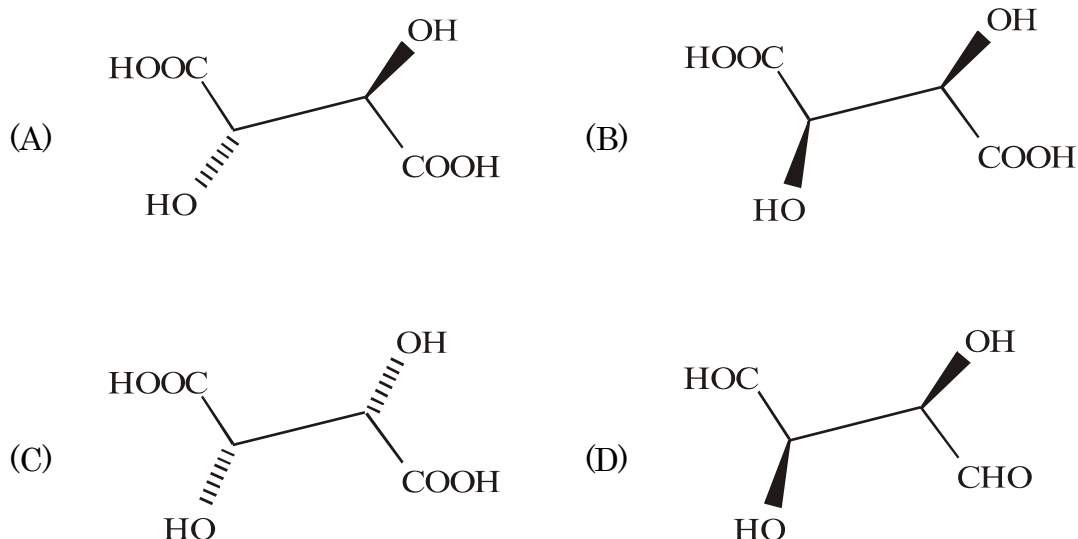
(A) Two

(B) Three

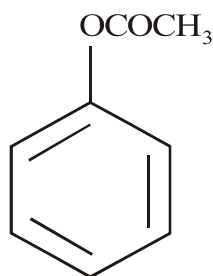
(C) One

(D) Four

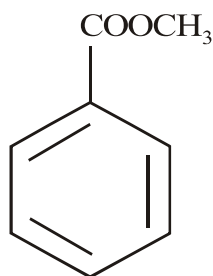
19. (2R, 3R)-D-Erythrose on oxidation with nitric acid gives tartaric acid. The correct stereochemical structure of the product in this case is :



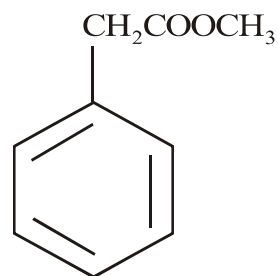
20. Consider the following compounds A, B and C.



(A)



(B)



(C)

The order of carbonyl stretching frequencies in the IR spectrum of the above is :

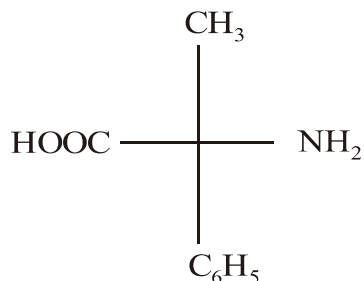
(A) $A < B < C$

(B) $A > B > C$

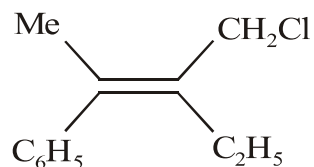
(C) $C > B > A$

(D) $A > C > B$

21. Consider the molecules I and II.



(I)



(II)

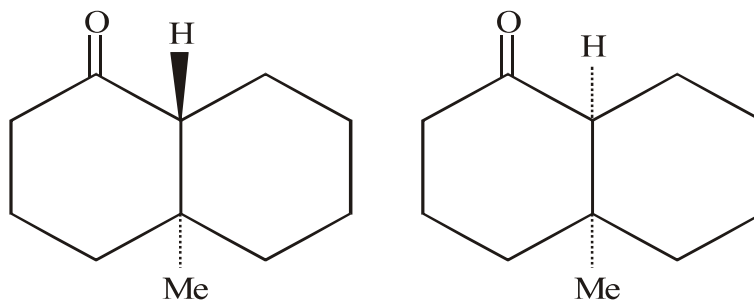
Which one of the following represents their correct configurational notation in terms of Cahn-Ingold-Prelog system ?

- | | (I) | (II) |
|-----|-----|------|
| (A) | R | S |
| (B) | S | E |
| (C) | R | Z |
| (D) | S | Z |

22. 2,2'-bis (diphenylphosphino)-1,1'-binaphthalene (BINAP) contains stereogenic centers and is a molecule.

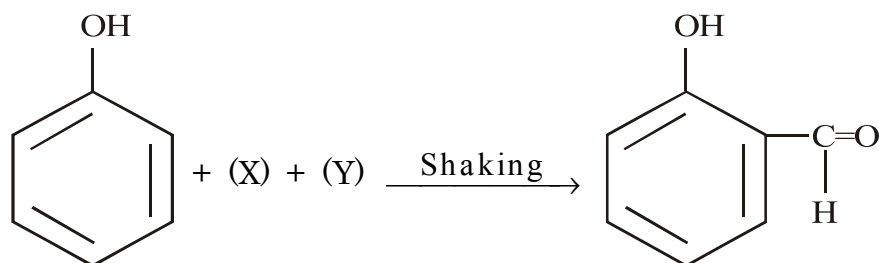
- | | |
|---------------------|------------------|
| (A) Zero, prochiral | (B) Zero, chiral |
| (C) Zero, achiral | (D) One, chiral |

23. The two compounds given below are :

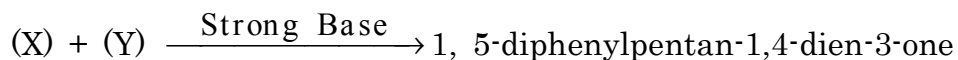


- (A) Diastereomers of each other
- (B) Identical
- (C) Enantiomers of each other
- (D) Regioisomers of each other
24. Diels-Alder reaction proceed via concerted cycloaddition $[4 + 2]$ path, hence they exhibited :
- (A) Regiospecificity
- (B) Stereospecificity
- (C) Regioselectivity
- (D) Stereoselectivity

25. Identify the X and Y reagents used in the following reaction :

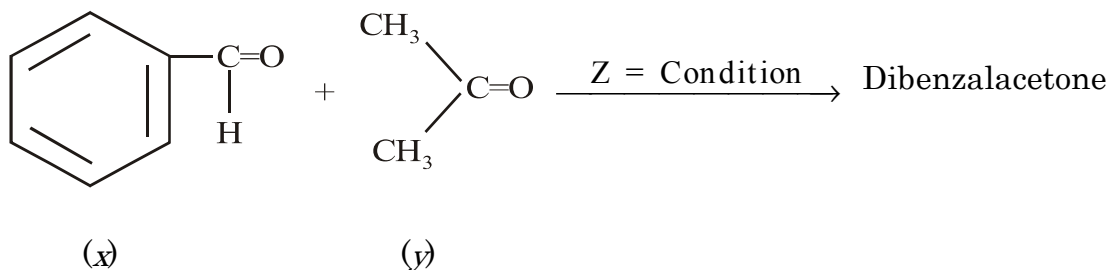


- (A) Alkali and CCl_4 (B) Alkali and CHCl_3
 (C) Alkali and CH_2Cl_2 (D) Alkali and CH_3Cl
26. Chlorobenzene substrate *does not* undergo nucleophilic substitution reaction under NTP with base/nucleophile, because it possess :
- (A) $(4n)\pi$ delocalized electron cloud
 (B) Strong electronegative chlorine atom
 (C) $(4n + 2)\pi$ delocalized electron cloud
 (D) Partial (C–Cl) double bond character
27. Identify the reacting compounds (X) and (Y) which on condensation forms the following product :



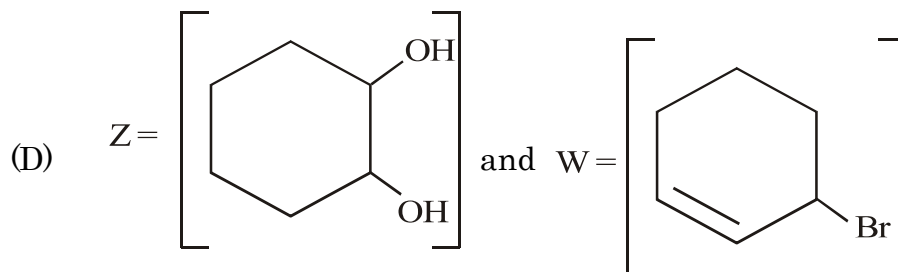
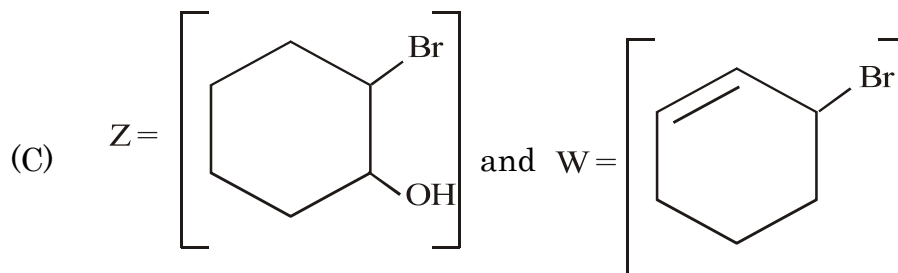
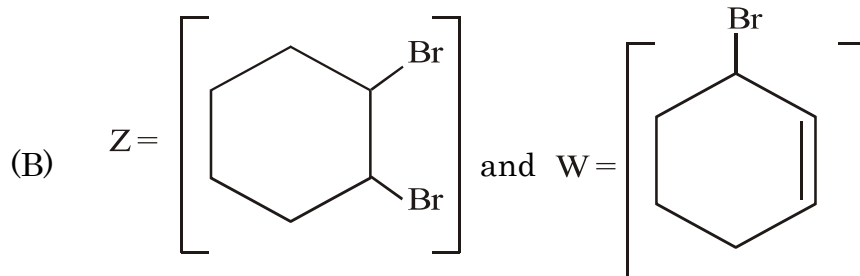
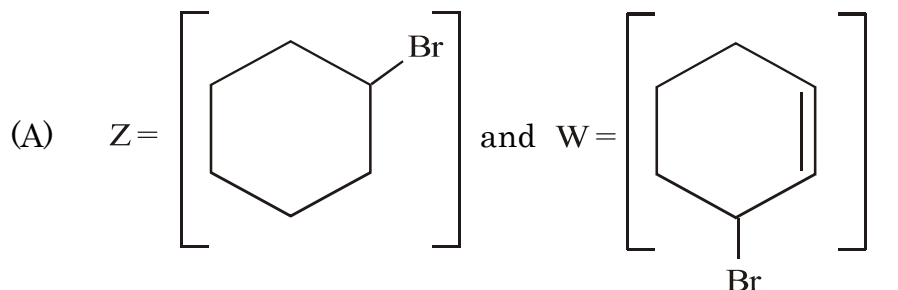
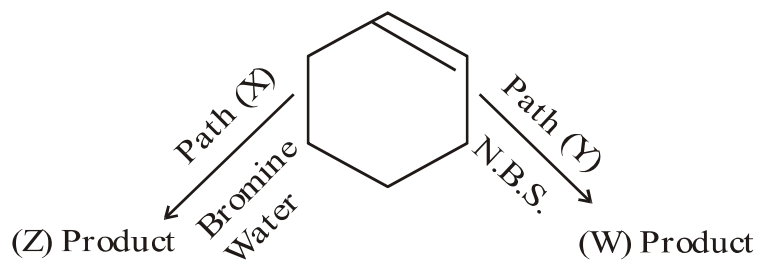
- (A) Acetone and Benzaldehyde via Aldol reaction
 (B) Acetaldehyde and Benzaldehyde via Aldol reaction
 (C) Acetophenone and Benzaldehyde via Aldol reaction
 (D) Benzophenone and Benzaldehyde via Aldol reaction

28. Identify the mole ratio of the substrate and the reaction condition for the formation of the following product :



- (A) $[x = 2 \text{ and } y = 1]$ under $z = \text{acidic conditions}$
- (B) $[x = 1 \text{ and } y = 2]$ under $z = \text{acidic conditions}$
- (C) $[x = 2 \text{ and } y = 1]$ under $z = \text{basic conditions}$
- (D) $[x = 1 \text{ and } y = 2]$ under $z = \text{basic conditions}$
29. Identify the product of reaction between diphenyl amine, sodium nitrite and hydrochloric acid $(\text{C}_6\text{H}_5)_2\text{NH} + \text{NaNO}_2 + \text{HCl} \rightarrow (\text{X})$ product :
- (A) $\text{X} = (\text{C}_6\text{H}_5)_2\text{N}-\text{N}=\text{O}$
- (B) $\text{X} = (\text{C}_6\text{H}_5)_2\text{N}-\underset{\text{H}}{\text{C}}_6\text{H}_4\text{N}=\text{O}$
- (C) $\text{X} = (\text{C}_6\text{H}_5)_2\text{N} \rightarrow \text{O}$
- (D) $\text{X} = (\text{C}_6\text{H}_5)_2\text{N}-\text{N}-(\text{C}_6\text{H}_5)_2$
30. The spin multiplicity of singlet carbene and triplet nitrene are respectively :
- (A) 0, 1
- (B) 1, 0
- (C) 1, 1
- (D) 0, 0

31. Predict the pair of product corresponding to path (x) and path (y) respectively in the given transformations :



32. The chemical abbreviation of DDT is one of the following :
- (A) *p*-dichlorodiphenyl trichloroethane
 - (B) *p*-dichlorodiphenyl tetrachloroethane
 - (C) *p*-dichlorodiphenyl trichloropropane
 - (D) *p*-dichlorodiphenyl tetrachlorobutane
33. The commercially important ore of lead is :
- (A) Bauxite
 - (B) Galena
 - (C) Haematite
 - (D) Cinnabar
34. Which of the following metals cannot be obtained by the electrolysis of their aqueous solution ?
- (A) Iron
 - (B) Lead
 - (C) Silver
 - (D) Sodium
35. Aluminothermic reaction is :
- (A) Oxidation reaction
 - (B) Reduction reaction
 - (C) Redox reaction
 - (D) Neutralization reaction
36. The ionization potentials of the given elements/ions change in the order :
- (A) $\text{Mg}^+ > \text{Na} > \text{Mg}^{2+}$
 - (B) $\text{Mg}^{2+} > \text{Mg}^+ > \text{Na}$
 - (C) $\text{Na} > \text{Mg}^+ > \text{Mg}^{2+}$
 - (D) $\text{Mg}^{2+} > \text{Na} > \text{Mg}^+$

37. The geometry and shape of XeO_3 is, respectively :
- (A) triangular and trigonal pyramidal
(B) tetrahedral and trigonal pyramidal
(C) tetrahedral and triangular planar
(D) trigonal pyramidal and triangular
38. A polynuclear metal carbonyl which contains only one bridging carbonyl group is :
- (A) $\text{Fe}_2(\text{CO})_9$ (B) $\text{Tc}_2(\text{CO})_{10}$
(C) $\text{Os}_2(\text{CO})_9$ (D) $\text{Fe}_3(\text{CO})_{12}$
39. The octahedral complexes are times stabilized as compared to the tetrahedral complexes when all other parameters except the geometry are same.
- (A) $\frac{4}{9}$ (B) $\frac{2}{3}$
(C) 2 (D) $\frac{9}{4}$
40. The number of types of isomerism possible in $[\text{Rh}(\text{en})_2 \text{Cl}(\text{NO}_2)]\text{Cl}$ and the number of isomers is, respectively :
- (A) 3 and 6 (B) 3 and 9
(C) 4 and 9 (D) 4 and 12
41. Which one of the following compounds has the smallest (Halogen-S-Halogen) bond angle ?
- (A) SOF_2 (B) SOCl_2
(C) SOBr_2 (D) SOI_2

42. Which of the following two are isostructural ?
- (A) XeF_2 and IF_2^- (B) NH_3 and BF_3
- (C) CO_3^{2-} and SO_3^{2-} (D) PCl_5 and ICl_5
43. The acidic character of the given hydroxides increases in the order :
- (A) $\text{B(OH)}_3 < \text{Mg(OH)}_2 < \text{Al(OH)}_3$
- (B) $\text{Mg(OH)}_2 < \text{B(OH)}_3 < \text{Al(OH)}_3$
- (C) $\text{B(OH)}_3 < \text{Al(OH)}_3 < \text{Mg(OH)}_2$
- (D) $\text{Mg(OH)}_2 < \text{Al(OH)}_3 < \text{B(OH)}_3$
44. Which of the following statements is *false* ?
- (A) The $\nu_{\text{C-O}}$ of free CO ligand is 2143 cm^{-1}
- (B) The $\nu_{\text{C-O}}$ band in $[\text{Ti(CO)}_6]^{2-}$ is higher in energy than those in free CO
- (C) The $\nu_{\text{C-O}}$ band in $[\text{Fe(CO)}_6]^{2+}$ is even higher in energy than those in free CO
- (D) In IR spectroscopy ν is proportional to $\sqrt{\frac{k}{\mu}}$
45. The electron paramagnetic resonance spectroscopy is well suited for distinguishing between :
- (A) Cu(I) and Ti(IV) complexes (B) Cu(I) and Zn(II) complexes
- (C) Cu(I) and Cu(II) complexes (D) Cu(I) and Sc(III) complexes

46. Precision of a set of replicate data is described by the term :
- (A) Absolute error (B) Determinant error
(C) Percent relative error (D) Coefficient of variation
47. An analytical method for the determination of calcium in limestone was tested by analysis of a NIST limestone containing 30.35% CaO. The mean result of five determinations was 30.41% with a standard deviation of 0.098%. What is the percent relative standard deviation ?
- (A) 0.06 (B) 0.32
(C) 0.12 (D) 0.24
48. The standard deviation in an analytical method for the determination of Pb in automotive exhaust was found to be 1.0 ppm. What is 90% confidence interval ($Z = 1.64$) for four replicate analysis ?
- (A) ± 0.041 (B) ± 0.123
(C) ± 0.164 (D) ± 0.082
49. Which one of the following properties is shown by normal error curve ?
- (A) Zero deviation from the mean occurring with minimum frequency
(B) Zero deviation from the mean occurring with maximum frequency
(C) Asymmetrical distribution of positive and negative deviations about this maximum
(D) Exponential increase in frequency as the magnitude of deviations increases
50. Chlorinated hydrocarbon in air sample was determined repeatedly for four times. The standard deviation was found to be 0.04 ppm. What is the standard error of mean ?
- (A) 0.04 (B) 0.02
(C) 0.01 (D) 0.16

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ROUGH WORK