**QUESTION BANK**

**MCQs**

|  |  |
| --- | --- |
| 1 | Predict the relationship between the given molecules:    I and II enantiomers and III is meso compound  I and II are same and III is meso compound  I, II and III all are diastereoisomers  I, II and III all are same |
|  |  |
| 2 | Identify the relationship between the molecule X and Y.    Diastereomers  Enantiomers  Identical  Structural isomers |
|  |  |
| 3 | Which of the following compounds is achiral?    D  C  B  A |
|  |  |
| 4 | Which of the following molecules is chiral?    I  II  III  IV |
|  |  |
| 5 | Predict the relationship between the given pair of molecules:  and   1. Enantiomers b. Homomers (Identical) c. Mesomers d. Diastereomers |
|  |  |
| 6 | Nomenclate the given molecule:    L-Glucose  D-Glucose  2R,3S,4R,5R-Glucose  2R, 3R, 4S, 5R- Glucose |
|  |  |
| 7 | Assign R/S or E/Z notation (whichever relevant) to the given molecule:     1. 2Z,4E,6E b. 2Z,4Z,6Z c. 2E,4Z,6E d. 2E,4E,6E |
|  |  |
| 8 | A mixture of equal quantities of two enantiomers is called as………  Racemic mixture  Diastereomeric mixture  Mesomer  Optical isomer |
|  |  |
| 9 | Assign R/S or E/Z notation (whichever relevant) to the given molecule:     1. 2R, 3S b. 2S,3R c. 2R,3R d. 2S,3S |
|  |  |
| 10 | Assign D/ L notation to the given compounds:    L-Arabinose and D-Alanine  D-Arabinose and L-Alanine  D-Arabinose and D-Alanine  L-Arabinose and L-Alanine |
|  |  |
| 11 | Which of the following compound has R-Configuration?    Compound-I  Compound-II  Compound-III  Compound-IV |
|  |  |
| 12 | Choose the best option to describe the given molecule:    The given molecule is chiral, since there is no centre of symmetry, plane of symmetry or alternating axis of symmetry.  The given molecule is achiral since there is a centre of symmetry.  The given moleule is achiral since there exists an alternating axis of symmetry in the molecule.  The given molecule is achiral since there is a plane of symmetry. |
|  |  |
| 13 | Which of the following is not used in partial asymmetric synthesis?  (R)-Lactic acid  D-Glyceradehyde  (±) Tartaric acid  Chiral borane |
|  |  |
| 14 | Identify the correct name with configuration of the following compound    (Z)-4-Bromo-3-methyl-pent-3-enoic acid  (Z)-2-Bromo-3-methyl-pent-2-enoic acid  (E)-2-Bromo-3-methyl-pent-2-enoic acid  (E)- 4-Bromo-3-methyl-pent-3-enoic acid |
|  |  |
| 15 | Nomenclate the following structure    1H-Pyrazolo[3,4-d]isoxazole  1H-Pyrazolo[4,3-d]oxazole  1H-Pyrazolo[2,3-c]oxazole  Oxazolo[4,3-d]1H-pyrazole |
|  |  |
| 16 | The given molecule is:     1. D- Lysine b. L- Lysine c. 2S- Lysine d. 2R- Lysine |
|  |  |
| 17 | Which of the following decrease in order of stability of cyclohexane conformation is correct?  Chair > twist boat > boat > half chair  Chair > boat > twist boat > half chair  Half chair > twist boat > boat > chair  Chair > boat > half chair > twist boat |
|  |  |
| 18 | …………………are stereoisomers resulting from hindered rotation about single bonds where the steric strain barrier to rotation is high enough to allow for the isolation of the conformers.  Enantiomers  Diastereomers  Mesomers  Atropisomers |
|  |  |
| 19 | Identify the structure of 3-Acetyl-4-chloro-6-ethyl-1H-indole.    Compound-I  Compound-III  Compound-IV  Compound-II |
|  |  |
| 20 | Which of the following resonating structures of Thiazole is incorrect?    Structure-I  Structure-III  Structure-IV  Structure-II |
|  |  |
| 21 | What is true about the given molecule?    The given biphenyl molecule exhibits atropisomerism and is optically inactive.  The given molecule exhibits a plane of symmetry and hence is achiral.  The given biphenyl molecule exhibits atropisomerism, and is optically active.  The given molecule possesses alternating axis of symmetry and hence is achiral. |
|  |  |
| 22 | Which of the following five membered heterocyclic rings is most basic?  Imidazole  Pyrazole  Thiazole  Oxazole |
|  |  |
| 23 | Which heterocycle is synthesized from malonic ester and urea?  Pyridine  Imidazole  Pyrimidine  Indole |
|  |  |
| 24 | Identify the wrong statement about geometrical isomers  It must contain a carbon-carbon double bond in the molecule  Two different atoms or groups must be linked to each doubly bonded carbon atoms.  Cis and trans are geometric isomers  It occurs due to the rotation of carbon-carbon single bond |
|  |  |
| 25 | Paal-Knorr synthesis of furan is…..  Cyclization of 1,4-diketone under acidic condition  Cyclization of 1,2-diketone under acidic condition  Cyclization of 1,3-diketone under acidic condition  Cyclization of 1,4-diketone under basic condition |
|  |  |
| 26 | Indicate the appropriate nomenclature for the following compound:    (3S,1E)-1-bromo-3-methylpent-1-ene  (3R,1E)-1-bromo-3-methylpent-1-ene  (3S,1E)-5-bromo-3-methylpent-4-ene  (3R,1Z)-1-bromo-3-methylpent-1-ene |
|  |  |
| 27 | 1. Enantiomers b. Homomers (Identical) c. Mesomers d. Diastereomers |
|  |  |
| |  | | --- | | 28 | | What is Chichibabin reaction?  Conversion of pyridine to 3-bromopyridine  Conversion of quinoline to 2-hydroxyquinoline  Conversion of pyridine to 2-aminopyridine  Conversion of quinoline to 8-bromoquinoline |
|  |  |
| 29 | Identify the Meso compound from the following: |
|  |  |
| 30 | Indicate the correct nomenclature for the following compound:    (4R,2Z)-3-Methyl-4-hydroxyhex-2-enal  (4S,2Z)-3-Methyl-4-hydroxyhex-2-enal  (4S,2Z)-3-Methyl-4-hydroxyhex-2-enal  (4R,2E)-3-Methyl-4-hydroxyhex-2-enal |
|  |  |
| 31 | Thioglutaric acid diesters, 1,2-diketone and strong base is used for  Radziszewski imidazole synthesis  Paal-Knorr synthesis of thiophene  Hinsberg thiophene synthesis  Gabriel synthesis of thiazole |
|  |  |
| 32 | According to Bayer's Theory which cycloalkane is more stable?  Cyclopentane  Cyclooctane  Cyclopropane  Cyclohexane |
|  |  |
| 33 | Bromination of thiophene gives….  2,3-dibromothiophene  3-bromothiophene  3,4-dibromothiophene  2-bromothiophene |
|  |  |
| 34 | Choose the relevant statement for the given pair of molecules:  and  A and B, both exhibit one butane gauche interaction.  Both, A and B are optically active.  Both, A and B have the same energy.  A exhibits four 1,3-Diaxial interactions but B has no 1,3- diaxial interactions |
|  |  |
| 35 | -------- are stereoisomers that result from a hindrance of bond rotation about single bonds due to steric, making the isolation of the individual isomers possible.  Diastereomers Constitutional isomers Enantiomers Atropisomers |
|  |  |
| 36 | Which of the following molecules will not exhibit optical activity?    A  B  C  D |
|  |  |
| 37 | Identify the product of the following reaction    Toluene  Ethylbenzene  Phenol  1-phenylethanol |
|  |  |
| 38 | Identify the molecule which is optical active:  Trans-1,2-Dimethyl-3-hydroxycyclopentane  Trans-1,2-Dimethylcyclobutane  Cis-1,2-Dimethylcyclobutane  Cis-1,2-Dimethylcyclopentane |
|  |  |
| 39 | A stereoselective reaction is one, which:  When carried out with stereoisomeric starting materials, gives a product from one reactant that is the stereoisomer of the product from the other.  One reaction site is preferred over another in the substrate.  Does not have a proper mechanism to explain the formation of product.  One stereoisomer predominates over another when two or more may be formed. |
|  |  |
| 40 | Which of the following drug is used as anti-lipidemic?  Ranitidine  Celecoxib  Atorvastatin  Zidovudine |
|  |  |
| 41 | Nomenclate the given molecules according to IUPAC rules:    2,3-Dihydro-1,4-oxazepine-6-formaldehyde  2,3-Dihydro-1,4-oxazepine-6-carbaldehyde  6,7-Dihydro-1,5-oxazepine-3-carbaldehyde  6,7-Dihydro-1,5-oxazepine-3-formaldehyde |
|  |  |
| |  | | --- | | 42 | | Nomenclate the given molecules according to IUPAC rules:    3-Methyl-3H-1,2,4-thiadiazine  2-Methyl-2H-1,3,6-thiadiazine  6-Methyl-1,2,5-thiadiazine  6-methyl-6H-1,2,5-thiadiazine |
|  |  |
| 43 | Identify the heterocycle in the given molecule  File:Ranitidine Structural Formulae.png - Wikimedia Commons  Oxazole  Pyrrole  Isoxazole  Furan |
|  |  |
| 44 | The correct structure of the heterocycle named 2H-Pyran is:  a. b.  c.  d. |
|  |  |
| 45 | What is increasing order of aromaticity of furan, thiophene and pyrrole?  Furan < Pyrrole < Thiophene  Furan < Thiophene < Pyrrole  Thiophene < Pyrrole < Furan  Pyrrole < Furan < Thiophene |
|  |  |
| 46 | The correct order of increasing resonance energy in these heterocycles is:  Pyrrole< Thiophene> Furan  Furan<Pyrrole< Thiophene  Thiophene< Furan< Pyrrole  Furan=Thiophene> Pyrrole |
|  |  |
| 47 | Which is the most preferred position in thiazole ring for sulphonation?  5  2  3  4 |
|  |  |
| 48 | The favourable position for electrophilic aromatic substitution in pyridine is \_\_\_\_\_  Position 2  Position 3  Position 4  Pyridine does not undergo electrophilic aromatic substitution |
|  |  |
| 49 | \_\_\_\_\_\_\_\_\_\_\_\_\_ involves the use of benzaldehyde and aminoacetal in presence of H2SO4  Skraup synthesis  Hantzsch synthesis  Friedlander’s synthesis  Pomeranz Fritsch reaction |
|  |  |
| 50 | Quinoline undergoes:  Tschitschibabin reaction to form 2-Aminoquinoline  Nitration to form 2-Nitroquinoline  Sulphonation to form Quinoline-6-sulphonic acid  Alkylation to form 4-Methylquinoline |
|  |  |
| 51 | Imidazole can be converted to Imidazole-4-sulphonic acid using:  Pyridine-sulphur trioxide  Hydrogen sulphide  Nitric acid and sulfuric acid  50-60% Oleum, 160°C |
|  |  |
| 52 | Identify the correct order of A, B, C, D in the following sequence:    Diphenylamine-2-carboxylic acid; Acridinone; 9,10- Dihydroacridine; Acridine  9,10- Dihydroacridine; Diphenylamine-2-carboxylic acid; Acridine; Acridinone  Acridine; Acridinone; 9,10- Dihydroacridine; Diphenylamine-2-carboxylic acid  Acridinone; Diphenylamine-2-carboxylic acid; Acridine; 9,10- Dihydroacridine |
|  |  |
| 53 | Pyrrole is \_\_\_\_\_\_\_ in nature while pyridine is \_\_\_\_\_\_\_\_\_ in nature.   1. Basic, neutral b. Basic, acidic c. Acidic, Basic d. Acidic, neutral |
|  |  |
| 54 | Condensation of formaldehyde and 2 moles of acetoacetic ester in presence of ammonia named as……………… synthesis.  Van-Leusen synthesis of oxazole  Hantzsch synthesis of pyridine  Madelung synthesis of indole  Gabriel synthesis of thiazole |
|  |  |
| 55 | Reaction of indole with formaldehyde and dimethylamine is the \_\_\_\_\_\_\_\_\_\_.  Vilsmeier Hack reaction  Van-Leusen reaction  Chichibabin reaction  Mannich reaction |
|  |  |
| 56 | Give the product of the reaction:     1. Pyrimidine-N-oxide c. Urea + Propanedioic acid 2. Urea + Propanedial d. Pyrimidine-N,N-dioxide |
|  |  |
| 57 | Beckmann rearrangement  Schmidt rearrangement  Claisen-Schmidt condensation  Dakin oxidation |
|  |  |
| 58 | Identify the reagents required to carry out synthesis of 1,2-dihydroquinoline by Skraup synthesis.  Acetaldehyde + aniline  Aniline + β-keto ester  Aniline + glycerol + nitrobenzene + H2SO4  Aniline + glycerol + H2SO4 |
|  |  |
| 59 | Identify the type of rearrangement involved in the following reaction.    Beckmann rearrangement  Schmidt rearrangement  Claisen Schmidt condensation  Clemmensen reduction |
|  |  |
| 60 | Which conformational isomer of butane have dihedral angle of 60 in between two methyl groups?  Eclipsed  Staggered  Gauche  Partially eclipsed |
|  |  |
| 61 | The reaction that yields predominantly one enantiomer of a possible pair is called as  Stereospecific  Regioselective  dynamic selective  Stereoselective |
|  |  |
| 62 | What is the medicinal use of clonidine?  Antilipidemic agent  Anti-HIV agent  Antimalarial agent  Antihypertensive agent |
|  |  |
| 63 | What is the therapeutic use of indomethacin?  Anti- HIV agent  Anticancer antibiotic  Antimalarial agent  Anti-inflammatory agent |
|  |  |
| 64 | Identify the heterocycle in the given drug moiety:  Celecoxib - Celecoxib, PHA-00846533   1. Imidazole b. Pyrrole c. Thiazole d. Pyrazole |
|  |  |
| 65 | Identify the reagent that will bring about the following reaction:     1. LiAlH4 b. Aluminium isopropoxide c. Na, NH3 d. NaBH4 |
|  |  |
| 66 | A B C D |
|  |  |
| 67 | Identify the reagents for the Wolff-Kishner reduction.  Na, liquid NH3, Alcohol  Lithium aluminium hydride, dry ether  Sodium borohydride  Hydrazine, potassium hydroxide, ethylene glycol |
|  |  |
| 68 | Imidazole is having high basicity value than oxazole, Thiazole because of  High stability of Imidazole  Presence of pyridine type of nitrogen  Inductive effect pyrrole type of nitrogen  Mesomeric effect of pyrrole type of nitrogen |
|  |  |
| 69 | The name of the given heterocycle is     1. Benzo[c]thiophene c. Benzo[b]thiophene 2. Benzo[a]thiolane d. Benzo[e]thiophene |
|  |  |
| 70 | Which of the following is the definition of chirality?  The superimposability of an object on its mirror image  A molecule with a mirror image  The non-superimposability of an object on its mirror image  A molecule that has a carbon atom with two different substituents |
|  |  |

**DESCRIPTIVE QUESTIONS**

|  |
| --- |
| Q1. Identify the relationship between each of the following pair of molecules. |
|  |
| Q2. With the help of an energy profile diagram, discuss the conformers of cyclohexane  Q3. Discuss in detail, the mechanism of the following synthesis:   1. Skraup synthesis for quinoline 2. Robinson Gabriel synthesis for oxazole 3. Hantzsch synthesis for pyridine 4. Traube synthesis for purine   Q4. With the help of an energy profile diagram, discuss the conformational analysis of n-butane. Indicate the most stable and the least stable conformer. |

Q5. Discuss any two methods of asymmetric synthesis, giving suitable example of an industrial application.

Q6. Attempt the following conversions:

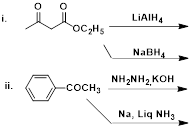
i. Acetone to N-methylacetamide

ii. Phenylacetic acid to Phenylmethanamine

iii. Pyrimidine to pyrazole

|  |
| --- |
| Q7. Name the reagents for the following conversions. |
| 1. 2-Methylbut-2-ene to 2-Methylbutane |
| 1. Pent-3-en-2-one to pent-3-en-2-ol |
| 1. Acetophenone to ethylbenzene |
| 1. Propionamide to propan-1-amine   Q8. Draw all possible projections of 2-Chloro-2-methyl-3-nitro-3-phenylpropan-1-ol. |

Q9. Give the products of the following reactions:



|  |
| --- |
| Q10. Enlist the methods available for resolving a racemic mixture. Suggest a suitable scheme of resolution of (±)2-Butanamine. |
| Q11. What will be the product of Birch reduction of benzoic acid? Write its mechanism.  Q12. Draw structures of the following   1. (Z) 2-Bromo-2-butenoic acid 2. (E) 3-Hydroxy-2-butenal 3. Cis and trans isomers of 1,2-dimethylcyclohexane   Q13. Explain in brief optical isomerism in substituted biphenyl compounds. |
| Q14. Identify the number of chiral carbons in 2,3-Dihydroxybutanedioic acid. Represent one enantiomeric and one diastereomeric pair for this molecule. Comment on the optical activity of these pairs.  Q15. Write the mechanism for the Beckmann and Schmidt rearrangement. |

Q16. Identify the products A, B, C and D of the following reactions.

|  |
| --- |
| Q17. Predict whether the following molecules are chiral or achiral. Identify the symmetry elements, if any. |
|  |

Q18. Identify the symmetry elements which may be present in the given molecules. Also predict whether the given molecule is chiral or achiral:



|  |
| --- |
| Q21. Discuss any one method for determination of configuration of geometrical isomers. Nomenclate for the following compounds. |
|  |

Q22. Explain the two necessary conditions for biphenyl compounds to exhibit optical activity with suitable examples.

Q23. Identify whether the following molecules are chiral/achiral. Justify the same.



Q24. Define atropisomerism. What conditions must such a molecule satisfy to exhibit optical activity? Outline a scheme to resolve a mixture of (±) 2-Chloropropanoic acid.

|  |
| --- |
| Q25. Identify the heterocyclic compound present in following drugs, also mention the medicinal uses.    Q26. Nomenclate the following molecules using recommendations of IUPAC/ Hantzsch  Widman rules/ Cahn-Ingold-Prelog rules, wherever applicable:    Q27. Give the products of following reactions (write structures).    Q28. Give mechanism for the following  Radziszewski Imidazole synthesis; Friedlander synthesis of quinoline  Q29. Draw the structure for the following compounds (any 3)  1. 5-Bromo-6H-1,3-thiazine  2. 3-Nitro-1H-pyrrole-2-carbaldehyde  3. 4-Phenylisoquinoline  4. 2-(Hydroxymethyl)-3,4-dihydropyrimidin-4-ol |
| Q30. Give the products of the following reactions. Discuss the mechanism of any one in detail:    Q31. Nomenclate the following structures    Q32. Using various oxidising and reducing agents, discuss oxidation and reduction of isoquinoline.  Q33. Give a correct IUPAC nomenclature for the following |

Q34. Give the products of the following reactions (**Any Six**):

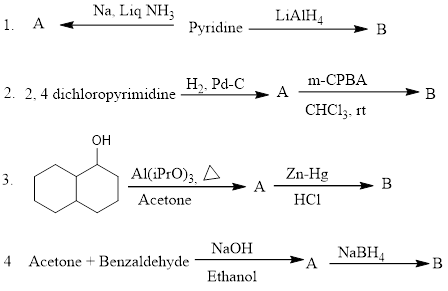
1. Furan + HgCl2/ aq. CH3COONa
2. Pyrazole + HNO3/ H2SO4
3. Thiazole + HgSO4/ H2SO4
4. Pyridine + NaNH2
5. Isoquinoline + H2O2 + Benzoic acid
6. Indole + HCHO + (CH3)2NH
7. Acetophenone + Zn/HCl
8. Acetamide + LiAlH4 /(C2H5)2O, H3O+

Q35. Write synthesis with reaction mechanism of the following

|  |
| --- |
| 1. Fischer indole synthesis |
| 1. Bischler Napieralski synthesis |
| 1. Traube synthesis |

Q36. Give the mechanism for Claisen-Schmidt condensation and Dakin reaction.

Q37. Complete the following



Q38. Assign R/S configuration to the given molecule



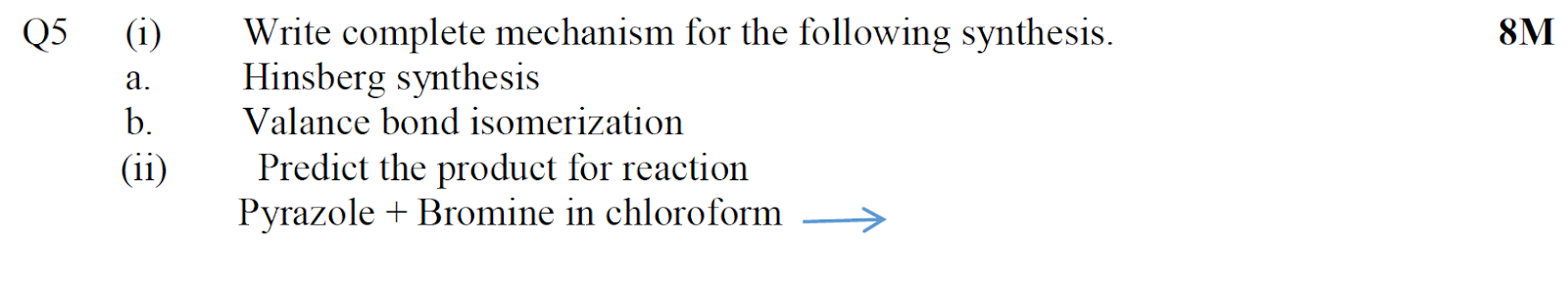
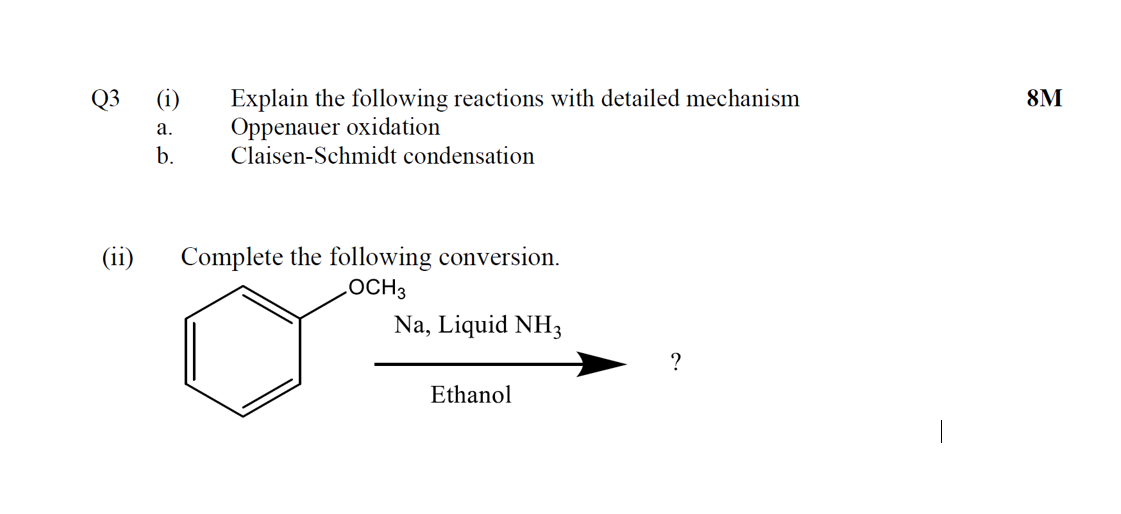
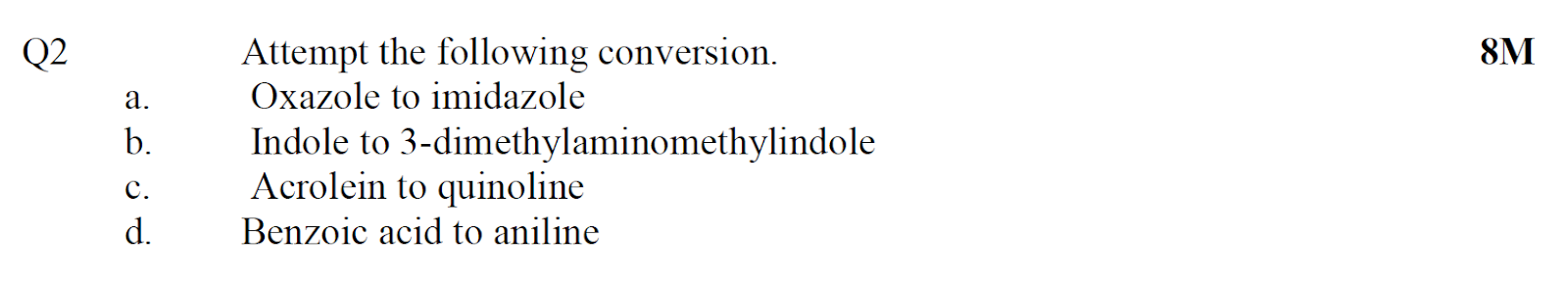
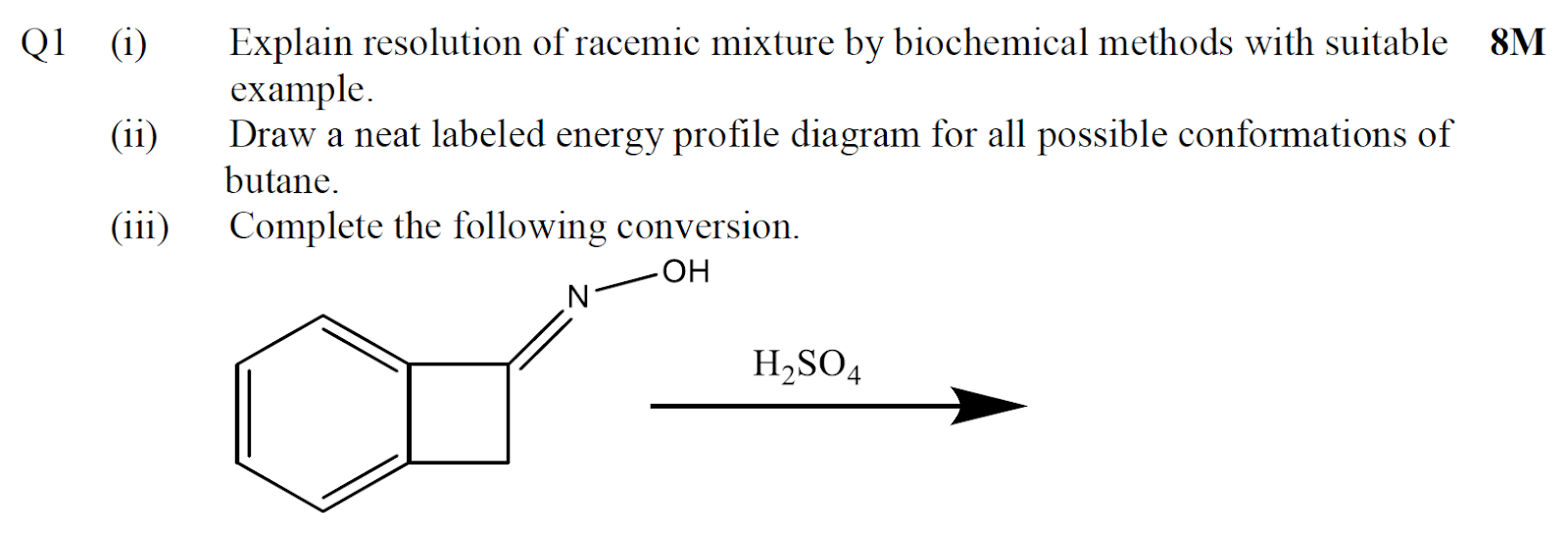
Q39. Identify the reagents which will aid the following conversions

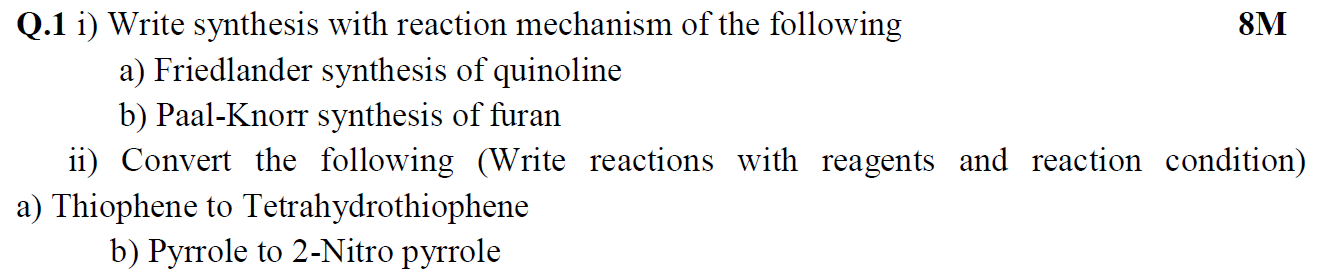
|  |
| --- |
| 1. Pyrrole to 3-bromopyrrole |
| 1. Isoquinoline to phthalic acid and quinolic acid |
| 1. Pyrazole to 4-nitropyrazole |
| 1. Indole to indole-3-sulfonic acid. |
| 1. Quinoline to 2-aminoquinoline |
| 1. 3-methylacetophenone to 3-methyl phenol |
| 1. Butan-2-one to n-butane |

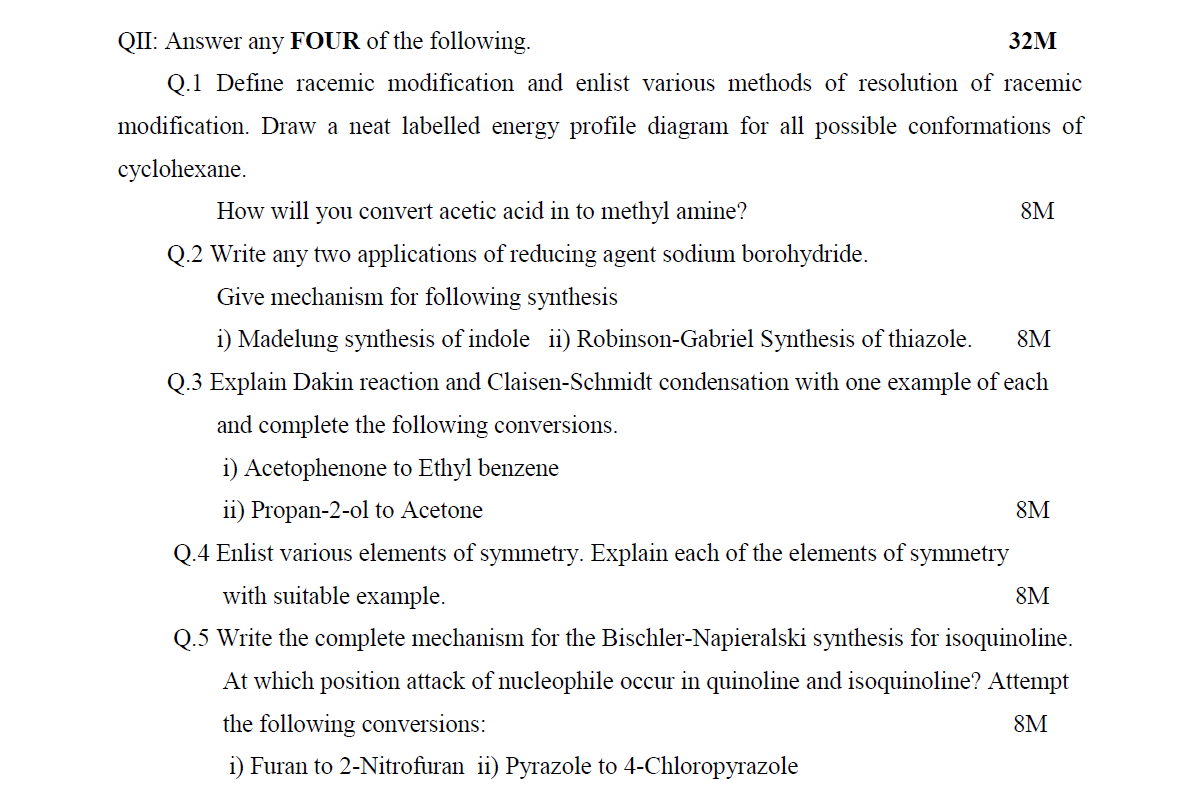
Q40. Complete the table:

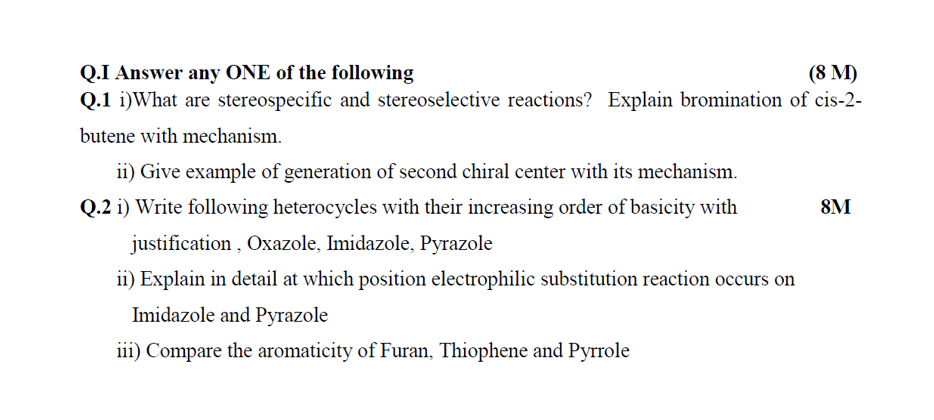
|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| STRUCTURE |  |  |  |  |
| **NAME OF THE DRUG** |  |  |  |  |
| **HETEROCYCLE PRESENT** |  |  |  |  |
| **MEDICINAL USE** |  |  |  |  |

Q41. Write medicinal uses of Clonidine, Tacrine, Zidovudine and Pyrantel pamoate.

Q42. 

****



****