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Chemistry Grade 12 — Chapter 7

Organic Chemistry

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Independent practice MCQs from the supplied Class 12 Chemistry notes pack. Total: 50 questions.

A. Important / Main Topics

1. Geometric isomerism is shown by:

(A) Alkenes
(B) Alkanes
(C) Alkynes
(D) Benzene

Correct Answer: A

Explanation: The notes state that geometric isomerism is shown by alkenes due to restricted rotation of the double bond.

2. What is the approximate energy required to break the pi bond in ethene?

(A) 12 kJ/mol
(B) 264 kJ/mol
(C) 120 kJ/mol
(D) 500 kJ/mol

Correct Answer: B

Explanation: The notes state that breaking the pi bond in ethene requires approximately 264 kJ/mol of energy.

3. Which of the following compounds can show cis-trans isomerism?

(A) Propene
(B) 1-butene
(C) 2-butene
(D) 1-pentene

Correct Answer: C

Explanation: 2-butene has two different groups on each double-bond carbon, so it can show cis-trans isomerism.

4. What is the main reason alkanes do not show geometric isomerism?

(A) They have a double bond.
(B) They have a pi bond.
(C) They are highly reactive.
(D) They have free rotation around single bonds.

Correct Answer: D

Explanation: Alkanes have single bonds that allow free rotation, so they cannot have fixed spatial arrangements of groups.

5. In the cis isomer, the identical groups are:

(A) On the same side of the double bond.
(B) On opposite sides of the double bond.
(C) Always on the same carbon atom.
(D) Not present.

Correct Answer: A

Explanation: In a cis isomer, identical groups are on the same side of the double bond.

6. The energy barrier to rotation around a carbon-carbon single bond is approximately:

(A) 264 kJ/mol
(B) 12 kJ/mol
(C) 500 kJ/mol

(D) 1000 kJ/mol

Correct Answer: B

Explanation: The notes state that the energy barrier for rotation around a single bond in ethane is about 12 kJ/mol.

7. What type of bond is formed by the side-to-side overlap of p orbitals?

(A) Sigma bond
(B) Ionic bond
(C) Pi bond
(D) Hydrogen bond

Correct Answer: C

Explanation: A pi bond is formed by the side-to-side overlap of unhybridized p orbitals.

8. Which of the following cannot show geometric isomerism?

(A) 2-pentene
(B) 2-hexene
(C) 3-hexene
(D) 1-hexene

Correct Answer: D

Explanation: 1-hexene has two hydrogen atoms on the terminal carbon, so it cannot show geometric isomerism.

9. Optical isomerism is a type of:

(A) Stereoisomerism
(B) Chain isomerism
(C) Position isomerism
(D) Functional group isomerism

Correct Answer: A

Explanation: Optical isomerism is a type of stereoisomerism.

10. What is the term for a mixture of equal amounts of two enantiomers?

(A) Meso compound
(B) Racemic mixture
(C) Chiral mixture
(D) Enantiomeric mixture

Correct Answer: B

Explanation: Racemic mixture — this correctly answers the question.

11. A molecule that is not superimposable on its mirror image is called:

(A) Achiral
(B) Meso
(C) Chiral
(D) Racemic

Correct Answer: C

Explanation: A molecule that is not superimposable on its mirror image is chiral.

12. Plane-polarized light vibrates in:

(A) All directions
(B) No plane
(C) A circular path
(D) A single plane

Correct Answer: D

Explanation: Plane-polarized light vibrates in A single plane.

13. The clock-wise rotating isomers are designated as:

(A) d or +
(B) l or -
(C) R

(D) S

Correct Answer: A

Explanation: Clockwise rotating isomers are designated as d or +.

14. Chiral molecules are those having carbon atoms bonded to:

(A) Two identical groups
(B) Four different groups
(C) Three identical groups
(D) Four identical groups

Correct Answer: B

Explanation: Chiral molecules are those having carbon atoms bonded to Four different groups.

15. Which of the following is an example of a chiral molecule?

(A) Methane
(B) Ethane
(C) 2-butanol
(D) Benzene

Correct Answer: C

Explanation: 2-butanol — this correctly answers the question.

16. Which of the following molecules can show geometric isomerism?

(A) Ethene
(B) Propene
(C) But-1-ene
(D) But-2-ene

Correct Answer: D

Explanation: But-2-ene — this correctly answers the question.

17. The energy barrier to rotation around a carbon-carbon double bond is approximately:

(A) 264 kJ/mol
(B) 12 kJ/mol
(C) 500 kJ/mol
(D) 1000 kJ/mol

Correct Answer: A

Explanation: The energy barrier is approximately 264 kJ/mol.

18. In a trans isomer, the identical groups are:

(A) On the same side of the double bond.
(B) On opposite sides of the double bond.
(C) On the same carbon atom.
(D) Not present.

Correct Answer: B

Explanation: In a trans isomer, identical groups are on opposite sides.

19. What is the hybridization of the carbon atoms in a double bond?

(A) sp
(B) sp^3
(C) sp^2
(D) sp^3d

Correct Answer: C

Explanation: The carbon atoms in a double bond are sp^2 hybridized.

20. Which of the following statements is true about geometric isomerism?

(A) It is shown by all alkenes.
(B) It is shown by alkanes.
(C) It is not a type of stereoisomerism.

(D) It is shown by alkenes with two different groups on each double-bond carbon.

Correct Answer: D

Explanation: It is shown by alkenes with two different groups on each double-bond carbon. — this correctly answers the question.

21. What is the relationship between the stability of cis and trans isomers?

(A) Trans isomers are generally more stable than cis isomers due to less steric hindrance.
(B) Cis isomers are generally more stable than trans isomers.
(C) Both isomers have the same stability.
(D) Stability depends only on the molecular weight.

Correct Answer: A

Explanation: Trans isomers are generally more stable than cis isomers due to less steric hindrance. — this correctly answers the question.

22. Which of the following compounds can and cannot show cis-trans isomerism and why? (i) 1-chloroprop-1-ene, (ii) 3-chloroprop-1-ene, (iii) hex-2-ene.

(A) (i) Yes, (ii) Yes, (iii) Yes.
(B) (i) Yes, (ii) No, (iii) Yes.
(C) (i) No, (ii) No, (iii) Yes.
(D) (i) No, (ii) Yes, (iii) No.

Correct Answer: B

Explanation: (i) 1-chloroprop-1-ene can show cis-trans isomerism; (ii) 3-chloroprop-1-ene cannot; (iii) hex-2-ene can.

23. What is the relationship between the two enantiomers of a chiral molecule?

(A) They are structural isomers.
(B) They are geometric isomers.
(C) They are non-superimposable mirror images.
(D) They are identical in every way.

Correct Answer: C

Explanation: Enantiomers are non-superimposable mirror images.

24. Which of the following statements about a racemic mixture is correct?

(A) It is optically active.
(B) It consists of only one enantiomer.
(C) It has a net rotation of polarized light.
(D) It consists of equal amounts of two enantiomers.

Correct Answer: D

Explanation: It consists of equal amounts of two enantiomers. — this correctly answers the question.

25. What is the specific rotation of a racemic mixture?

(A) Zero.
(B) Always positive.
(C) Always negative.
(D) It depends on the concentration.

Correct Answer: A

Explanation: A racemic mixture has a specific rotation of zero because the rotations of the two enantiomers cancel out.

B. Less Important / Secondary Topics

26. The drug thalidomide is an example of a molecule that:

(A) Has two enantiomers with different biological activities.
(B) Has only one enantiomer.
(C) Is not chiral.
(D) Is a racemic mixture with no side effects.

Correct Answer: A

Explanation: Thalidomide has two enantiomers with different biological activities.

27. Which of the following is NOT a requirement for a molecule to show optical isomerism?

(A) A chiral center.
(B) A double bond.
(C) Non-superimposable mirror images.
(D) Four different groups attached to a carbon atom.

Correct Answer: B

Explanation: A double bond is not required for optical isomerism.

28. What is the term for the process of separating a racemic mixture into its two enantiomers?

(A) Racemization
(B) Hybridization
(C) Resolution
(D) Isomerization

Correct Answer: C

Explanation: The separation of a racemic mixture into its enantiomers is called resolution.

29. Which of the following is a meso compound?

(A) A compound with no chiral centers.
(B) A compound that is always optically active.
(C) A compound that is a racemic mixture.
(D) A compound with a plane of symmetry and chiral centers.

Correct Answer: D

Explanation: A meso compound has chiral centers but also has a plane of symmetry, making it optically inactive.

30. Which of the following is a correct statement about the stability of geometric isomers?

(A) Trans isomers are generally more stable than cis isomers due to less steric hindrance.
(B) Cis isomers are always more stable than trans isomers.
(C) Both isomers have exactly the same stability.
(D) Stability depends only on the number of carbon atoms.

Correct Answer: A

Explanation: Trans isomers are generally more stable than cis isomers due to less steric hindrance. — this correctly answers the question.

31. Which of the following molecules can show geometric isomerism?

(A) CH□=CH-CH□
(B) CH□-CH=CH-CH□
(C) CH□-CH□-CH=CH□
(D) CH□=CH-CH□-CH□

Correct Answer: B

Explanation: CH□-CH=CH-CH□ (2-butene) can show geometric isomerism.

32. Which of the following compounds is optically active?

(A) Meso-tartaric acid
(B) Racemic mixture of lactic acid
(C) Pure (R)-lactic acid
(D) Pure (S)-lactic acid

Correct Answer: C

Explanation: Pure (R)-lactic acid is optically active.

33. What is the relationship between the two enantiomers of a chiral molecule?

(A) They are structural isomers.
(B) They are geometric isomers.
(C) They are identical in every way.

(D) They are non-superimposable mirror images.

Correct Answer: D

Explanation: Enantiomers are non-superimposable mirror images.

34. Which of the following statements about a racemic mixture is correct?

(A) It consists of equal amounts of two enantiomers.
(B) It is optically active.
(C) It consists of only one enantiomer.
(D) It has a net rotation of polarized light.

Correct Answer: A

Explanation: It consists of equal amounts of two enantiomers. — this correctly answers the question.

35. What is the specific rotation of a racemic mixture?

(A) Always positive.
(B) Zero.
(C) Always negative.
(D) It depends on the concentration.

Correct Answer: B

Explanation: Zero. — this correctly answers the question.

36. Which of the following statements is true about the reactivity of optical isomers?

(A) They have different physical properties.
(B) They have different chemical properties.
(C) They rotate the plane of polarized light in opposite directions.
(D) They have different molecular formulas.

Correct Answer: C

Explanation: They rotate the plane of polarized light in opposite directions. — this correctly answers the question.

37. Which of the following pairs of enantiomers have different smells?

(A) (+)-asparagine and (-)-asparagine
(B) (+)-ibuprofen and (-)-ibuprofen
(C) (+)-thalidomide and (-)-thalidomide
(D) (+)-limonene and (-)-limonene

Correct Answer: D

Explanation: (+)-limonene and (-)-limonene — this correctly answers the question.

38. What is the term for the study of the absorption, distribution, metabolism, and excretion of a drug?

(A) Pharmacokinetics
(B) Pharmacodynamics
(C) Pharmacology
(D) Toxicology

Correct Answer: A

Explanation: Pharmacokinetics is the study of ADME.

39. Which of the following is a chiral molecule?

(A) Methane
(B) 2-butanol
(C) Ethane
(D) Benzene

Correct Answer: B

Explanation: 2-butanol — this correctly answers the question.

40. Which enantiomer of thalidomide is teratogenic?

(A) (+)-thalidomide
(B) Both
(C) (-)-thalidomide

(D) Neither

Correct Answer: C

Explanation: The (-)-enantiomer of thalidomide is teratogenic.

41. Why is it important to separate enantiomers in drug manufacturing?

(A) Because they have different physical properties.
(B) Because they have different molecular formulas.
(C) Because they have different colors.
(D) Because they can have different biological activities.

Correct Answer: D

Explanation: Enantiomers can have different biological activities.

42. Which of the following is a method for separating enantiomers?

(A) Chiral chromatography
(B) Distillation
(C) Filtration
(D) Evaporation

Correct Answer: A

Explanation: Chiral chromatography is used to separate enantiomers.

43. What is the term for the interconversion of enantiomers in the body?

(A) Resolution
(B) Racemization
(C) Hybridization
(D) Isomerization

Correct Answer: B

Explanation: Racemization is the interconversion of enantiomers in the body.

44. Which of the following molecules shows optical isomerism?

(A) CH□=CHCH□CH□
(B) (CH□)□CHCl
(C) CH□=CHCH(Cl)CH□
(D) CH□CH□CH□CH=CH□

Correct Answer: C

Explanation: CH□=CHCH(Cl)CH□ — this correctly answers the question.

45. How many chiral centers are present in 2-methylbutan-2-ol?

(A) 1
(B) 2
(C) 3
(D) 0

Correct Answer: D

Explanation: 0 — this correctly answers the question.

46. Which of the following is optically active?

(A) All chiral molecules
(B) Racemic mixture
(C) Meso-compounds
(D) All asymmetric molecules

Correct Answer: A

Explanation: All chiral molecules are optically active.

47. Which one is an incorrect statement about optical isomers?

(A) They cause different rotation of plane polarized light.
(B) The double bond carbon in alkenes acts as a chiral center.
(C) They have no functional groups.

(D) Alkanes cannot show optical isomerism.

Correct Answer: B

Explanation: The double bond carbon is sp² hybridized and cannot be a chiral center.

48. What is the term for a mixture of equal amounts of two enantiomers?

(A) Meso compound
(B) Chiral mixture
(C) Racemic mixture
(D) Enantiomeric mixture

Correct Answer: C

Explanation: Racemic mixture — this correctly answers the question.

49. Which of the following is a chiral catalyst?

(A) Palladium on carbon
(B) Platinum
(C) Nickel
(D) BINOL

Correct Answer: D

Explanation: BINOL — this correctly answers the question.

50. What is the purpose of optical resolution?

(A) To separate a racemic mixture into its enantiomers.
(B) To synthesize a single enantiomer.
(C) To racemize a mixture.
(D) To destroy a chiral center.

Correct Answer: A

Explanation: To separate a racemic mixture into its enantiomers. — this correctly answers the question.