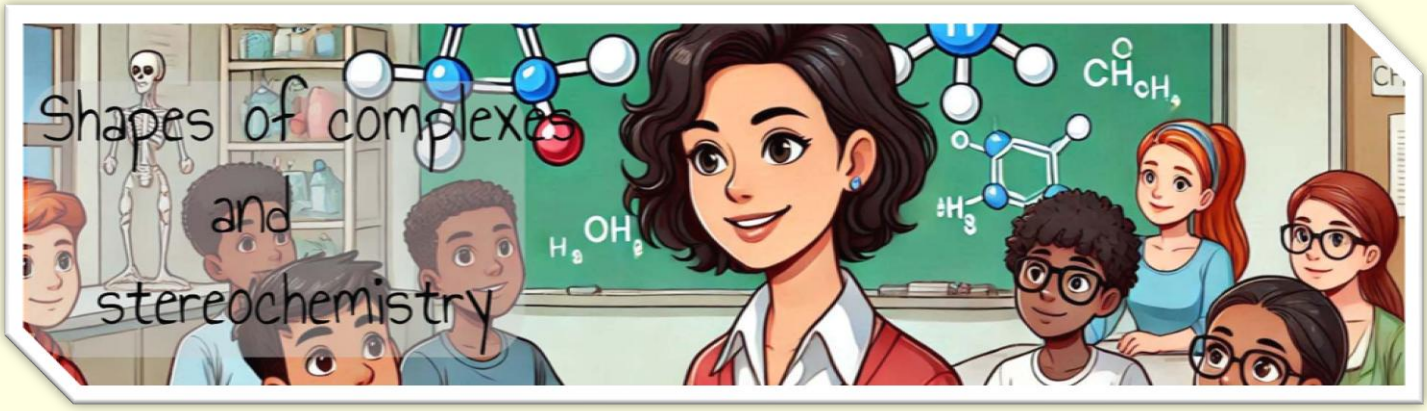


Answer all the questions below as fully as you can then check your answers

1. Which of the following two statements about geometric isomerism in square planar complexes is correct?
   A) Ligands must all be monodentate for geometric isomerism to occur.
   B) Geometric isomerism occurs when identical ligands are positioned either adjacent to or opposite each other.
   C) Only complexes with the formula MA4 can exhibit geometric isomerism.
   D) All square planar complexes exhibit geometric isomerism.

2. Which type of ligand is required for a complex to exhibit optical isomerism?
   A) Monodentate B) Polydentate
   C) Bidentate D) Any ligand type

3. What is the bond angle between adjacent ligands in a square planar complex?
   A) 60° B) 90° C) 109.5° D) 180°

4. Define the term stereoisomer.

5. Explain the difference between cis and trans isomers in a square planar complex.

6. Why do alkene molecules with a C=C bond exhibit geometric isomerism?

7. Draw and label the cis and trans isomers of the square planar complex $[Pt(NH_3)_2Cl_2]$.

8. The complex ion $[Co(NH_3)_4Cl_2]^+$ exists as cis and trans isomers. Describe how you could distinguish these two isomers experimentally.

9. Explain why the complex $[Co(en)_3]^{3+}$ exhibits optical isomerism but not geometric isomerism.

Answers

1. Which of the following two statements about geometric isomerism in square planar complexes is correct?

   A) Ligands must all be monodentate for geometric isomerism to occur.

   B) Geometric isomerism occurs when identical ligands are positioned either adjacent to or opposite each other.

   C) Only complexes with the formula MA4 can exhibit geometric isomerism.

   D) All square planar complexes exhibit geometric isomerism.

   Answer: B

2. Which type of ligand is required for a complex to exhibit optical isomerism?

   A) Monodentate B) Polydentate

   C) Bidentate D) Any ligand type

   Answer: C

3. What is the bond angle between adjacent ligands in a square planar complex?

   A) 60° B) 90° C) 109.5° D) 180°

   Answer: B

4. Define the term stereoisomer.

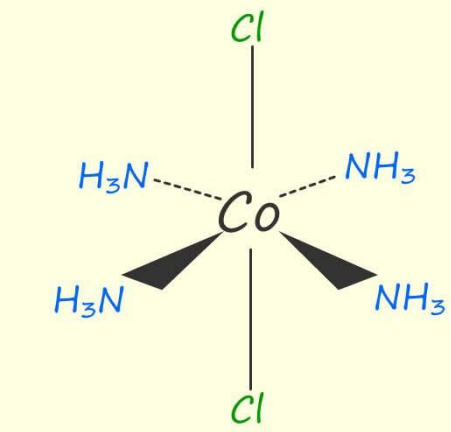
   Answer: Stereoisomers are compounds that have the same structural formula but the atoms are arranged differently in three-dimensional space.

5. Explain the difference between cis and trans isomers in a square planar complex.

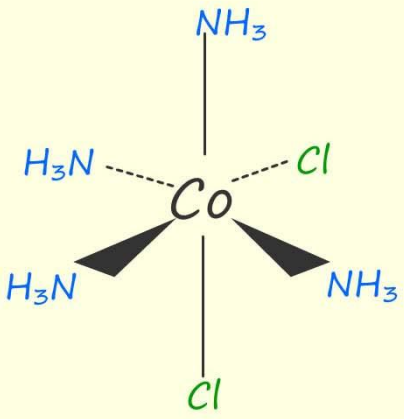
   Answer: In the cis-isomer, two identical ligands are adjacent to each other (90° apart), whereas in the trans-isomer, two identical ligands are positioned opposite each other (180° apart).

6. Why do alkene molecules with a C=C bond exhibit geometric isomerism?
   Answer: Geometric isomerism occurs in alkenes due to restricted rotation around the carbon-carbon double bond.

7. Draw and label the cis and trans isomers of the square planar complex $[Pt(NH_3)_2Cl_2]$.
   Answer:



trans isomer



cis isomer

   a. Cis: The two NH_3 ligands are adjacent to each other, and the two Cl ligands are adjacent to each other.
   b. Trans: The NH_3 ligands are opposite each other, and the Cl ligands are opposite each other.

8. The complex ion $[Co(NH_3)_4Cl_2]^+$ exists as cis and trans isomers. Describe how you could distinguish these two isomers experimentally.
   Answer: The cis and trans isomers can be distinguished by observing differences in their dipole moments (cis-isomer is polar, trans-isomer is nonpolar).

9. Explain why the complex $[Co(en)_3]^{3+}$ exhibits optical isomerism but not geometric isomerism.

   Answer: The complex contains three bidentate ethylenediamine ligands, which form non-superimposable mirror images (optical isomers). Geometric isomerism does not occur because there are no distinguishable positions for cis and trans arrangements.