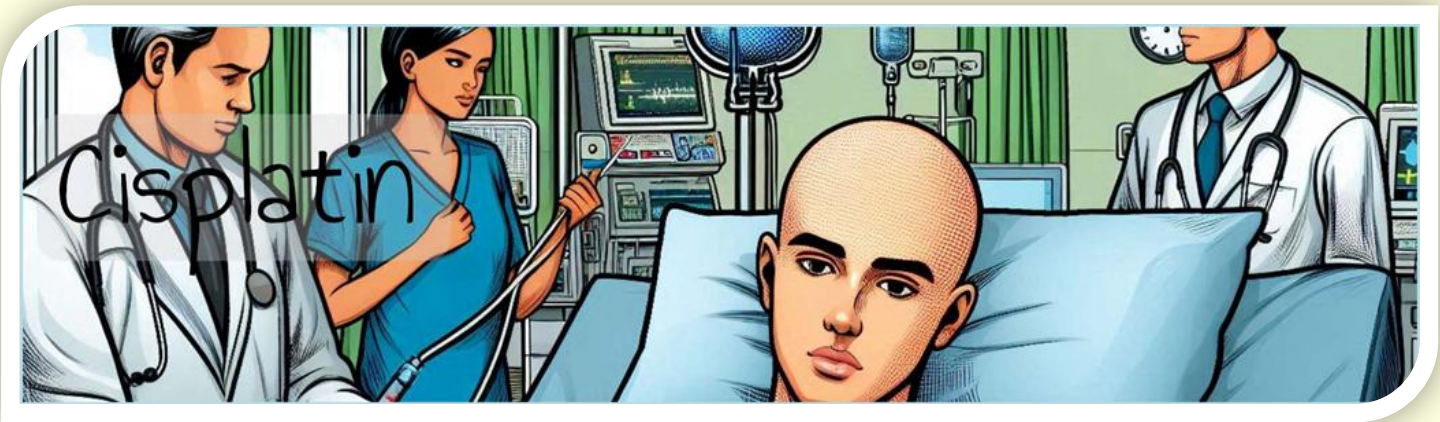


Answer all the questions below as fully as you can then check your answers

1. Who discovered cisplatin as an anticancer drug?
   a) Marie Curie b) Barnett Rosenberg
   c) Robert Boyle d) Alfred Nobel

2. What is the coordination geometry of cisplatin?
   a) Tetrahedral b) Square planar
   c) Octahedral d) Trigonal planar

3. Why does cisplatin mainly target cancer cells?
   a) It binds only to cancer cell DNA.
   b) Cancer cells divide more rapidly, making them more susceptible to DNA damage.
   c) It is activated only in cancer cells.
   d) It is delivered directly to tumours using nanoparticles.

4. Describe the role of chloride ions in the activation of cisplatin.

5. Explain why the trans isomer of $[Pt(NH_3)_2Cl_2]$ is not effective as an anticancer drug.

Fill-in-the-Blanks to complete the sentences below:

6. Cisplatin is effective in treating cancers such as _____, _____, and _____.

7. Cisplatin distorts the _____ structure by forming _____ between adjacent guanine bases.

8. Cisplatin is administered as an intravenous solution with a concentration of 0.1 mol dm^{-3}. Calculate the number of moles of cisplatin in 250 cm^3 of this solution.

True or false questions:

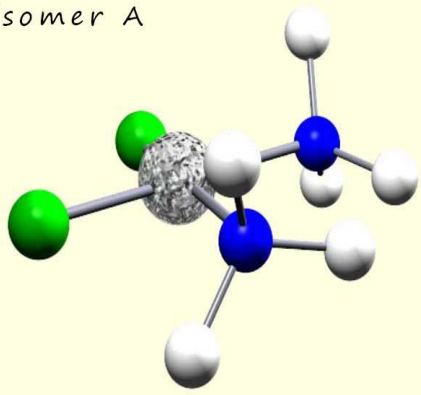
9. Cisplatin works by breaking the DNA strands completely.

10. Cisplatin's side effects include nephrotoxicity and hearing loss.

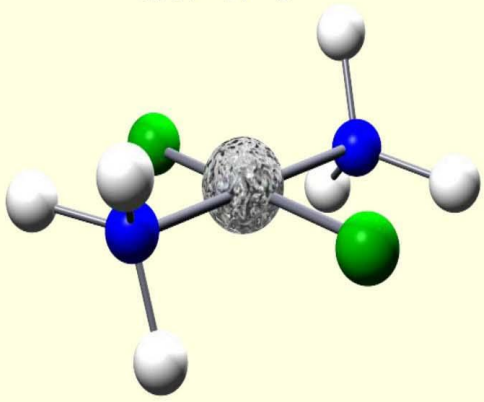
11. Discuss the discovery of cisplatin and how its mechanism of action disrupts cancer cell growth.

12. Below is a diagram showing the structures of cis-$[Pt(NH_3)_2Cl_2]$ and trans-$[Pt(NH_3)_2Cl_2]$. Identify which isomer is active in killing cancer cells and explain why.

isomer A



isomer B



13. Match the following terms with their definitions:

a) Nephrotoxicity

b) Ligand exchange reaction

c) Square planar geometry

1. A reaction where one ligand is replaced by another.

2. A toxic effect on the kidneys caused by cisplatin accumulation.

3. The molecular geometry of cisplatin.

Answers

1. Who discovered cisplatin as an anticancer drug?
   a) Marie Curie b) Barnett Rosenberg
   c) Robert Boyle d) Alfred Nobel
   Answer: b) Barnett Rosenberg

2. What is the coordination geometry of cisplatin?
   a) Tetrahedral b) Square planar
   c) Octahedral d) Trigonal planar
   Answer: b) Square planar

3. Why does cisplatin mainly target cancer cells?
   a) It binds only to cancer cell DNA.
   b) Cancer cells divide more rapidly, making them more susceptible to DNA damage.
   c) It is activated only in cancer cells.
   d) It is delivered directly to tumours using nanoparticles.
   Answer: b) Cancer cells divide more rapidly, making them more susceptible to DNA damage.

4. Describe the role of chloride ions in the activation of cisplatin.
   Answer: In the low chloride ion concentration inside cells, the chloride ligands of cisplatin are replaced by water molecules in a ligand exchange reaction, activating the molecule to bind DNA.

5. Explain why the trans isomer of $[Pt(NH_3)_2Cl_2]$ is not effective as an anticancer drug.
   Answer: The trans isomer cannot form the intrastrand cross-links between adjacent guanine bases in DNA, which are essential for distorting the DNA and preventing replication.

Fill-in-the-Blanks to complete the sentences below:

6. Cisplatin is effective in treating cancers such as _____, _____, and _____.
   Answer: testicular, ovarian, bladder

7. Cisplatin distorts the _____ structure by forming _____ between adjacent guanine bases.
   Answer: DNA; intrastrand cross-links

8. Cisplatin is administered as an intravenous solution with a concentration of 0.1 mol dm^{-3}. Calculate the number of moles of cisplatin in 250 cm^3 of this solution.
   Answer: No of no moles=0.1 mol dm^{-3}×0.250 dm^3=0.025 mol

True or false questions:

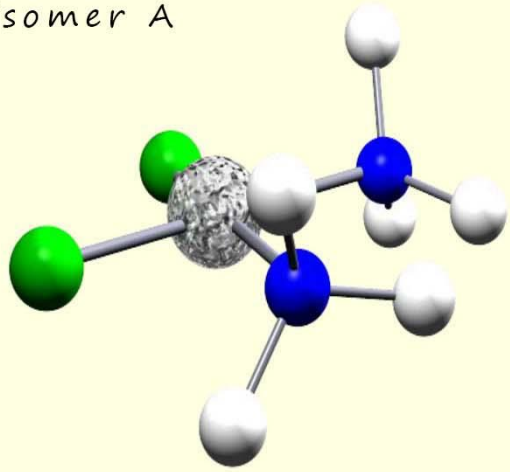
9. Cisplatin works by breaking the DNA strands completely.
   Answer: False (It forms cross-links, distorting the DNA rather than breaking it entirely.)

10. Cisplatin's side effects include nephrotoxicity and hearing loss.
    Answer: True

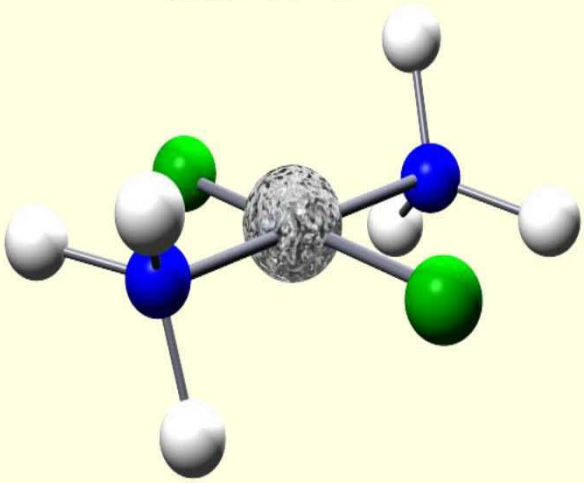
11. Discuss the discovery of cisplatin and how its mechanism of action disrupts cancer cell growth.
    Answer:
    Cisplatin was discovered by Barnett Rosenberg and his team in 1965 while studying the effect of electric fields on bacterial growth. Platinum electrodes released a platinum compound that inhibited bacterial cell division. The active compound, cis-$[Pt(NH_3)_2Cl_2]$, was found to be effective in treating cancers. Once activated inside cells, cisplatin binds to guanine bases in DNA, forming intrastrand cross-links. These distort the DNA helix, preventing replication and leading to apoptosis (cell death) in rapidly dividing cancer cells.

13. Below is a diagram showing the structures of cis-$[Pt(NH_3)_2Cl_2]$ and trans-$[Pt(NH_3)_2Cl_2]$. Identify which is the active isomer active explain why.

isomer A



isomer B



Answer: Isomer A is the active compound cis-$[Pt(NH_3)_2Cl_2]$. Its cis configuration allows adjacent chloride ligands to bind guanine bases in DNA, forming the intrastrand cross-links essential for its anticancer activity. The trans isomer (isomer B) cannot form these cross-links.

14. Match the following terms with their definitions:

a) Nephrotoxicity

b) Ligand exchange reaction

c) Square planar geometry

1. A reaction where one ligand is replaced by another.

2. A toxic effect on the kidneys caused by cisplatin accumulation.

3. The molecular geometry of cisplatin.

Answer:

a) 2, b) 1, c) 3