

# WC2 – Cisplatin

Name:

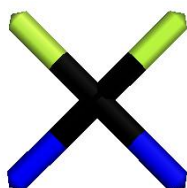
Date:

Download and then open the file **1a84\_Cisplatin\_2** in PyMOL. This is a structure of DNA which has been bound to the drug cisplatin. Use this structure, as well as your own knowledge to answer the following questions.

1. Give a use of the drug cisplatin.

Cisplatin is used as an **anticancer** drug in chemotherapy.

2. Cisplatin is a square planar complex, shown below. What is the metal ion at the centre of the drug?



- a) Pt
- b) Pt<sup>+</sup>
- c) Pt<sup>2+</sup> ✓
- d) Pt<sup>4+</sup>

3. Describe how the overall structure of the DNA has been affected because cisplatin has bound. How is it different to usual DNA?

DNA usually exists in a **double helix**. The cisplatin has caused the double helix of the two DNA strands to **kink**, this loses the normal shape of a double helix.

4. The cisplatin molecule shown above has two amine groups, and two chlorine groups. However, when the drug binds, it loses two of its ligands. Which ligands are lost, and why does this happen?

The **Cl ligands are lost**. This happens because they are naturally quite labile – they are easily lost. Cl<sup>-</sup> is a very stable ion, it is found abundantly in water, and NaCl dissolves readily. This explains why the Cl<sup>-</sup> ligands are lost easily, because it is stable. It happens because the central metal ion, Pt<sup>2+</sup>, acts by **binding to the nitrogen atoms in the guanine DNA bases**.

5. DNA is necessary for cell replication to occur. Cisplatin binds to, and distorts DNA. Explain how cisplatin works as a drug, and what makes it effective for its purpose.

Cisplatin is an **anticancer** drug. Cancers arise when the process of cell replication goes into overdrive, and large masses of cells form **tumours**. Cisplatin **binds to DNA and distorts** it, this **stops it from replicating** effectively. **If the cancerous cells cannot replicate, then the cancer cannot spread.**

6. Explain why drugs like cisplatin can have adverse effects.

Cisplatin disrupts cell replication. Although it attacks cancerous cells, it can also attack **non-malignant** ones. This means that it can **damage and kill healthy cells**, causing damage to the patient.

7. Describe how the side effects of a chemotherapy drug like cisplatin can be reduced.

By targeting the drug to the cancerous area. By using as little of the drug as necessary.