

DNA & ANTICANCER DRUGS

STRUCTURE OF DNA



Deoxyribonucleic acid (DNA) is the molecule which contains the genetic information for life. It is a **double helix**, meaning that there are two polymer strands which wrap around each other.

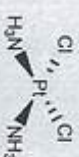
DNA



ANTICANCER DRUGS

CISPLATIN

Cisplatin is a platinum complex with the formula $\text{Pt}(\text{NH}_3)_2(\text{Cl})_2$. It has the square planar structure:

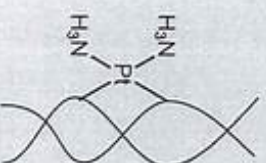


ACTION OF CISPLATIN

Cisplatin is a very commonly used anticancer drug. It works by binding to DNA and preventing the DNA from being 'read', so the cells which contain cisplatin cannot replicate.

When cisplatin binds to DNA, the Cl ligands are replaced with nitrogen atoms in guanine bases of a DNA molecule. This is called **ligand replacement**.

Cisplatin with chloride ligands replaced by guanine nitrogens.



The cisplatin changes the shape of the DNA molecule, bending it and preventing it from being replicated.

EVALUATING THE EFFECTS

Pros

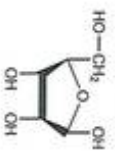
Cisplatin and many other anticancer drugs are very potent because they stop cells dividing. Despite the damage these drugs can cause, it may still be worth using them because leaving the cancer untreated may be much more devastating. Using these drugs may increase recovery rate, reduce risk of death and improve quality of life in the long term.

Cons

One downside of these drugs is that they are not very specific to the cells they target. This kind of anticancer drug causes damage to any part of the body which is rapidly replicating, including the cancerous tissue, but also commonly hair follicles, the stomach lining and throat cells.

THE SUGAR

2-deoxyribose is a five-carbon sugar molecule (pentose).



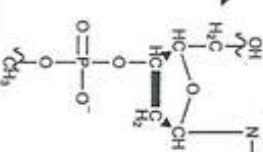
PHOSPHATE

Phosphate ions have the structure:



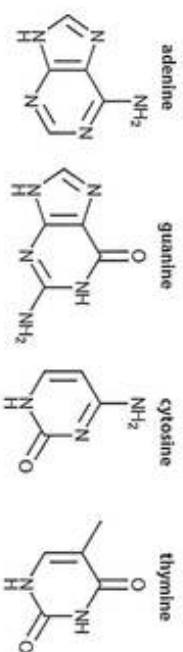
NUCLEOTIDES

The monomers which make up the DNA polymer chains are called nucleotides. Each nucleotide is made up of a phosphate ion bonded to a ribose sugar bonded to a base.



BASES

The bases are given the letters A, G, C and T, which represent:



These bases are what gives the DNA its code.

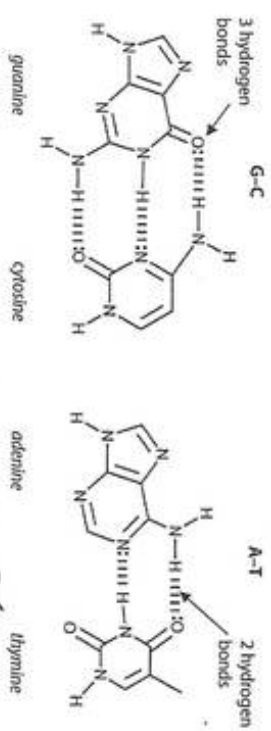
G bonds with C, A bonds with T.

COMPLEMENTARY

The strands in DNA are held together by hydrogen bonding between bases. Guanine (G) can hydrogen bond to cytosine (C), and adenine (A) can hydrogen bond to thymine (T). This means that the strands are **complementary** to each other. For example:

Strand 1 G C C T G A A C
Strand 2 C G G A C T T G

G pairs with C and A pairs with T due to the number of hydrogen bonds each can form. G and C can form three hydrogen bonds, and A and T can form only two.



EXAM TIP

The structure of the bases is on the data sheet, but practise drawing how they bond together until you get them right!