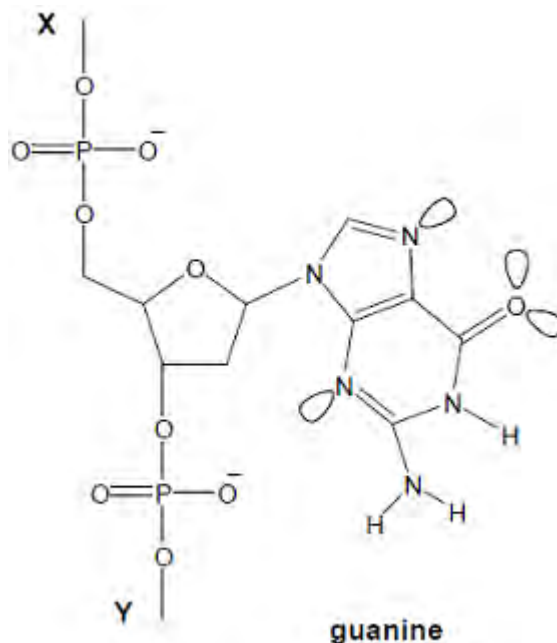


Q1. The anticancer drug cisplatin operates by reacting with the guanine in DNA.

Figure 1 shows a small part of a single strand of DNA. Some lone pairs are shown.

Figure 1



- (a) The DNA chain continues with bonds at X and Y.

State the name of the sugar molecule that is attached to the bond at X.

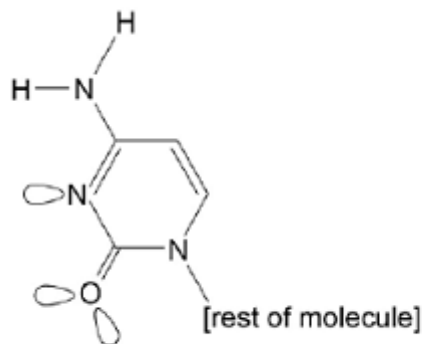
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(1)

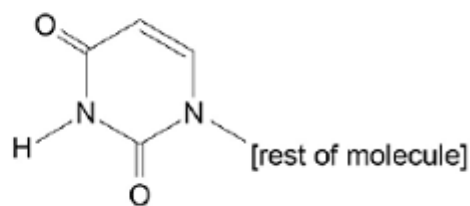
- (b) Messenger RNA is synthesised in cells in order to transfer information from DNA. The bases in one strand of DNA pair up with the bases used to synthesise RNA.

Figure 2 shows two bases used in RNA.

Figure 2



**Base A**



**Base B**

Suggest which of the bases **A** and **B** forms a pair with guanine in **Figure 1** when messenger RNA is synthesised.

Explain how the base that you have chosen forms a base pair with guanine.

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(4)

- (c) Cisplatin works because one of the atoms on guanine can form a co-ordinate bond with platinum, replacing one of the ammonia or chloride ligands. Another atom on another guanine can also form a co-ordinate bond with the same platinum by replacing another ligand.

On **Figure 1**, draw a ring round an atom in guanine that is likely to bond to platinum.

(1)

- (d) An adverse effect of cisplatin is that it also prevents normal healthy cells from replicating.

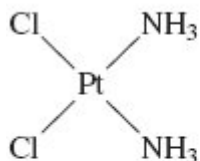
Suggest **one** way in which cisplatin can be administered so that this side effect is minimised.

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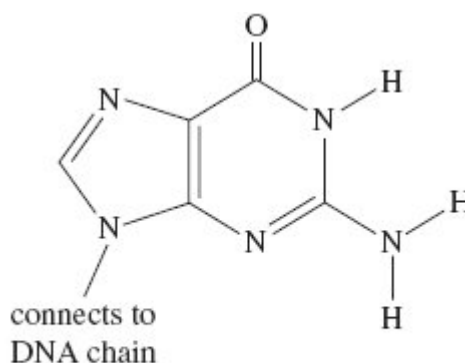
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(1)  
(Total 7 marks)

**Q2.** The complex cisplatin acts as an anticancer drug by changing the properties of DNA when it reacts with guanine, a component of DNA.



cisplatin



guanine

When cisplatin is absorbed into the human body, it undergoes a ligand substitution reaction and one chloride ligand is replaced by a water molecule forming a complex ion **Q**.

(a) Write an equation for this substitution reaction to form the complex ion **Q**.

.....  
(2)

(b) The complex ion **Q** can bond to guanine in two different ways.

(i) The first way involves a hydrogen atom, from one of the ammonia ligands on **Q**, bonding to an atom in a guanine molecule. State the type of bond formed to guanine and identify an atom in guanine that could form a bond to this hydrogen atom.

Type of bond .....

Atom in guanine .....

(2)

(ii) The second way involves a ligand substitution reaction in which an atom in a guanine molecule bonds to platinum by displacing the water molecule from **Q**. State the type of bond formed between guanine and platinum when a water molecule is displaced and identify an atom in guanine that could bond to

platinum in this way.

Type of bond .....

Atom in guanine .....

(2)

- (c) State and explain **one** risk associated with the use of cisplatin as an anticancer drug.

Risk .....

Explanation .....

(2)

(Total 8 marks)