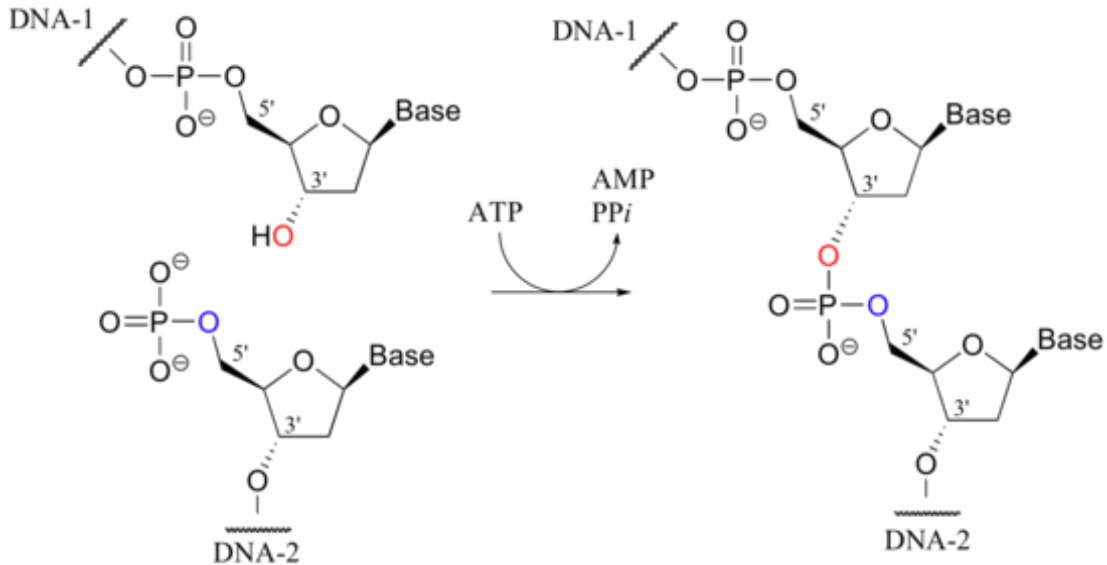


(Hand-in problems must be done on separate pages & short answer questions typed)

- The enzyme DNA ligase catalyzes the linkage between two DNA molecules according to the following chemical reaction:



Explain the role of ATP in this reaction. (Your answer must be much more detailed than “Energy” or “To make it exergonic”)

- In addition to the canonical “B-form” of DNA, and the less common “A” and “Z” forms, there are other known DNA structures that involve 3 or 4 DNA strands. One theoretical DNA structure, known as “R-form” DNA, has been proposed to play a role in homologous DNA recombination. Do some research into R-DNA and describe both the structure and its proposed biological function. (*Cite your sources and use more than the paper entitled “The R-form of DNA does exist”*)
- Draw all structures (products and reactants) and mechanisms (*i.e.* electron pushing) for the following chemical events:
 - The hydrolysis of the base from uridylate
 - Adenylation of the 3' end of oligonucleotide 5'-AAA-3' using ATP

- c. The deamination of deoxyguanylate
- d. The methylation of the deoxyoligonucleotide 5'-GATC-3' by Dam methylase
- e. The formation of the common second messenger, cGMP from GTP