What do the initials DNA stand for?

DNA History:

1940's:

1947: Chargaff
   Chargaff's Rule

1950's:

Early 1950's: Rosalind Franklin:
   X-ray crystallography of DNA

1952: Hershey & Chase: (p. 185; Fig. 10.1)
   Discovered DNA is the genetic material of bacteriophages (p. 183; Fig. 10.0)
   Bacteriophages are viruses that infect bacteria (bacteria eaters)
   Conclusions: viral DNA injected into bacteria, which made more viruses

1953: Watson & Crick:
   Used information from Franklin's X-ray photos to make a wire scale model
   Conclusions:

Late 1950's: Meselson & Stahl
   Working with bacteria (E. coli)
   Confirmed Watson & Crick's model for DNA replication

Brief review of DNA structure:
DNA is a polymer of?

Components of a nucleotide: (p. 186; Fig. 10.2A)
   a) 
   b) 
   c)
Two classes of nitrogenous bases: (p. 187; Fig. 10.2 B & C)

a) **Purines**
   1) 
   2) 

b) **Pyrimidines**
   1) 
   2) 
   3) 

Which nitrogenous base is only found in RNA?

Which nitrogenous base is only found in DNA?

Which nitrogenous bases are found in both DNA and RNA?

**Base pairing of nitrogenous bases (Chargaff’s Rule):**

<table>
<thead>
<tr>
<th>Purines</th>
<th>Pyrimidines</th>
<th>Base pairs</th>
<th># of H-bonds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adenine (A)</td>
<td>Thymine (T)</td>
<td>A = T</td>
<td></td>
</tr>
<tr>
<td>Guanine (G)</td>
<td>Cytosine (C)</td>
<td>G = C</td>
<td></td>
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</tbody>
</table>

Adenine comprises 20% of the nitrogenous bases in the DNA of a particular organism. What percentage does cytosine comprise?

DNA structure:
Double helix - shaped like a ladder (p. 189; Fig. 10.3C)

a) Backbone (legs) of the ladder composed of:

b) Rungs of the ladder composed of:

Double helix: 2 nm, suggested 2 strands
10 nucleotide pairs in each helix turn

DNA strands are **antiparallel** (p. 191; Fig. 10.5B)

Why would a cell undergo DNA replication?

What phase of the cell cycle does DNA replication take place? (p. 131; Fig. 8.5)
DNA Replication (synthesis):

Enzymes involved in DNA replication:

1) helicase:

2) single strand binding protein:

3) primase:

4) DNA polymerase: a) b) c)

5) DNA ligase:

Origins of replication: (p. 191; Fig. 10.5A)

Replication bubble:

Eukaryotes: thousands of replication bubbles
Why?

Replication Fork: (p. 191; Fig. 10.5C)

Replication bubble creates a Y-shaped region

Replication will spread in both directions:

Priming for DNA Replication:

Before DNA polymerase can begin work on the daughter strands, a primer must be laid first.

Which enzyme produces the primer?

What type of molecule is the primer?

Synthesis of the new DNA strands:

Once the RNA primers are in place, DNA polymerase can go to work.

DNA polymerase catalyses the synthesis of the new strands:

Direction of synthesis: ______________________

Why?

Leading strand:

A different DNA polymerase will come and convert the RNA primer to DNA nucleotides
Lagging strand:

Okazaki's fragments:

Role of DNA ligase:

**Semi-conservative model for DNA Replication:**
Watson & Crick suggested & Meselson & Stahl confirmed:

```
DNA template           New DNA strand
|                  |                  |
|                  |                  |
```

**Proofreading:**

**DNA Repair:**
Damage to DNA through:

Excision repair:

**DNA Technology:**

**Recombinant DNA technology:**

Use plasmid (small circular DNA) from bacteria
- Insert the gene of interest into the plasmid
- Put plasmid back into bacteria
- Allow bacteria to replicate => many copies of that gene
- Isolate gene and transfer into other organisms
  - Ex. Gene for pest resistance inserted into plants
    - Gene used to alter bacteria for cleaning up toxic waste

Protein dissolves blood clots in heart attack therapy
Human growth hormone treats stunted growth
Analysis of DNA from different sources:

Restriction Fragment Length Polymorphism (RFLP):

Restriction enzymes:

Use of RFLP's: