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GENETIC AN INTEGRATED APPROACH ANALYSIS

SECOND EDITION

7

DNA Structure and Replication

Clicker Questions by
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In a nucleotide, to which carbons are the phosphate and base attached?

- a) 5' phosphate ... 3' base
- b) 3' phosphate ... 5' base
- c) 5' phosphate ... 1' base
- d) 1' phosphate ... 5' base

DNA replication in both prokaryotes and eukaryotes may be described as follows:

- a) bidirectional and dispersive
- b) unidirectional and conservative
- c) unidirectional and semiconservative
- d) bidirectional and semiconservative

What did the theta structures observed by Cairns indicate about the mechanism of DNA replication in *E. coli*?

- a) Replication initiates from a single origin.
- b) Replication is semiconservative.
- c) Replication is unidirectional.
- d) Replication is bidirectional.

Which protein is responsible for the initial denaturation of *oriC* in *E. coli*?

- a) DnaA
- b) helicase
- c) topoisomerase
- d) single-stranded binding protein (SSB)

Which protein relaxes supercoiling caused by DNA unwinding at the replication fork in *E. coli*?

- a) DNA polymerase III
- b) helicase
- c) single-stranded binding protein (SSB)
- d) topoisomerase

Which protein removes the RNA primer from nascent DNA in *E. coli*?

- a) DNA polymerase III
- b) DNA polymerase I
- c) primase
- d) DNA ligase

Which of the following is the correct sequence of steps in a typical PCR reaction?

- a) primer annealing, denaturation, primer extension
- b) primer extension, primer annealing, denaturation
- c) denaturation, primer extension, primer annealing
- d) denaturation, primer annealing, primer extension

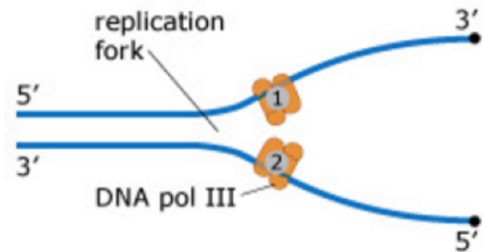
Exercise 3:

With what medium did Hershey and Chase label phage proteins and DNA to distinguish them and trace each radioactive label in the course of infection?

solution

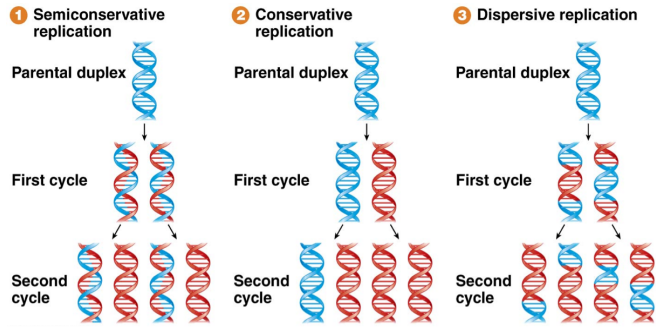
Exercise 6:

What is the direction in which the two strands elongate, recall there are two polymerases III labeled 1 and 2)?



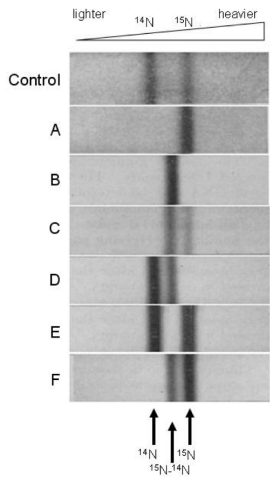
solution

Meselson and Stahl's competing models of DNA Replication:



Exercise 7:

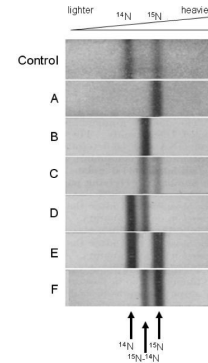
Which panel shows the band location (s) that would support a hypothesis of conservative replication?



solution

Exercise 8:

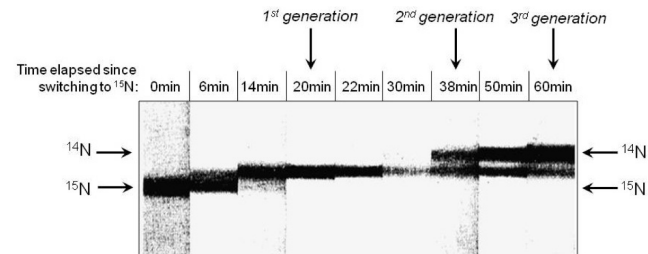
Which panel shows the band location (s) that would support a hypothesis of dispersive DNA replication?



solution

Exercise 9:

Determine if the DNA Replication is semiconservative, conservative or dispersive.



solution

Exercise 10:

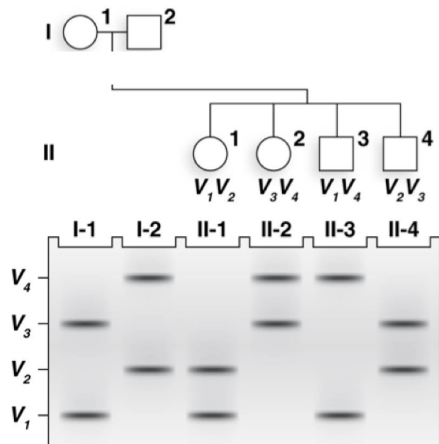
Separation of PCR (Polymerase Chain Reaction):

Identify the genotype of the parents with the following DNA gel containing PCR fragments generated by amplification of DNA from each parent (I-1 and I-2).

Example:

Parent I-1 is V3, V1

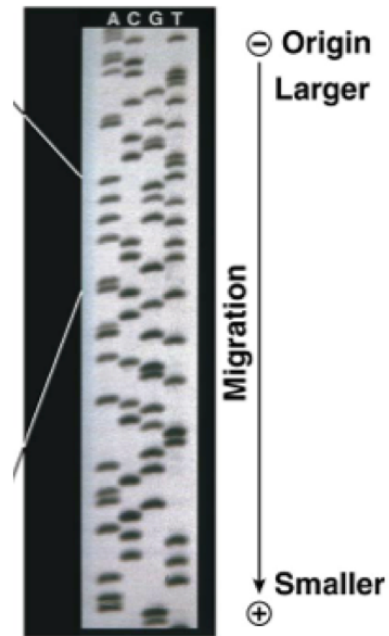
Parent I-2 is V1, V2



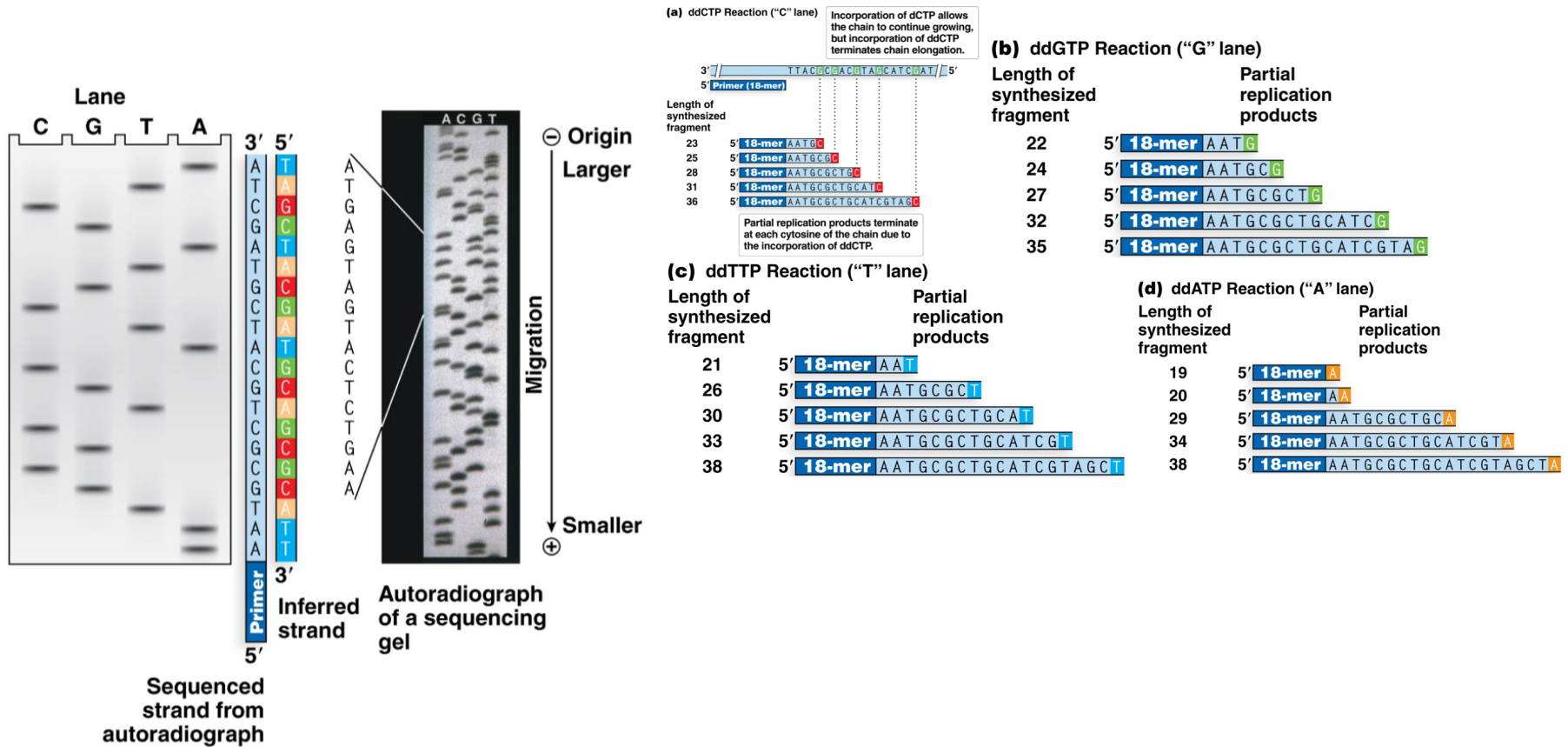
solution

Exercise 11:

Both images are the same interpretation of PCR Sanger sequencing, with the knowledge you have, describe the sequence that will be obtained from the following PCR lane?



Autoradiograph
of a sequencing
gel



Whenever a ddNTP is incorporated into the product DNA molecule, replication ceases.

A separate reaction is carried out for A, T, G, and C, using the corresponding small amount of ddNTP. Each reaction tube produces a series of partial DNA molecules, each of which ends with that nucleotide. (Shown in next images)

The shortest bands are the DNA products closest to the primer and these travel fastest on the gel; the gel is read from the bottom up, all four lanes together.