

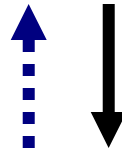
Enzymes in the central dogma

Cellular enzymes

(Mostly) RNA virus
enzymes

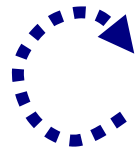
DNA  **DNA polymerase**

**Reverse
transcriptase**



RNA polymerase

**RNA-dependent
RNA polymerase**



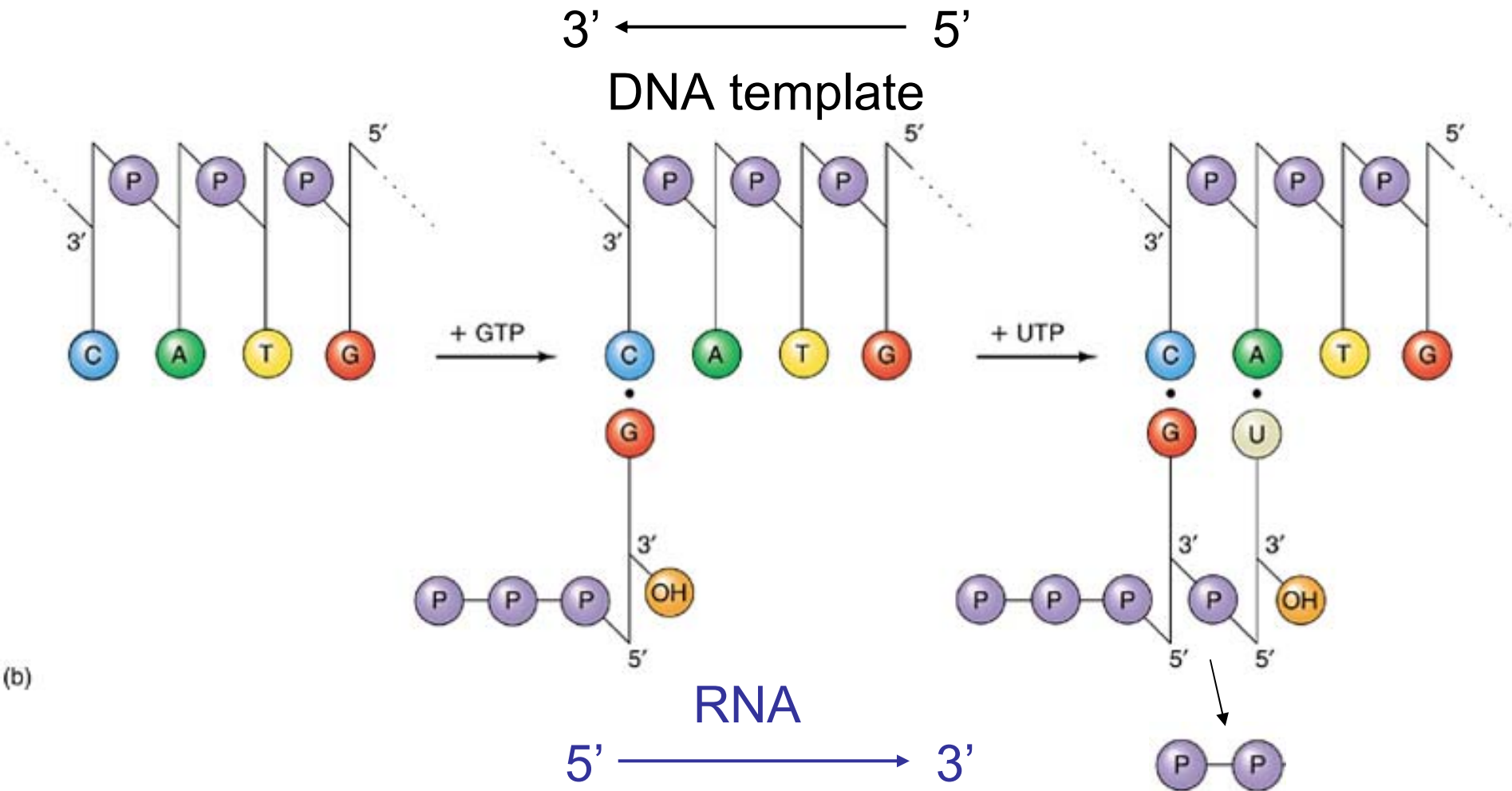
RNA



Ribosome

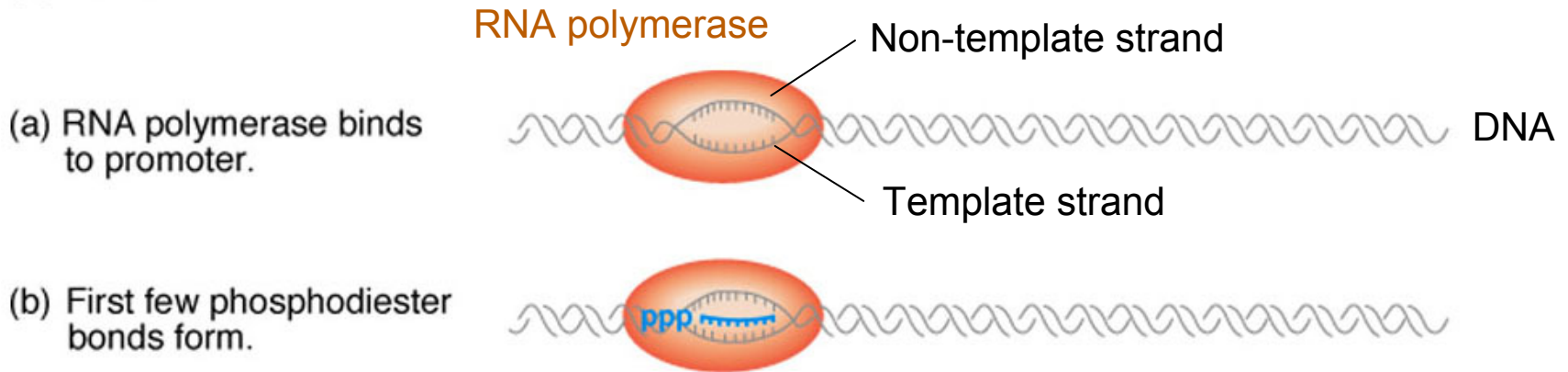
Protein

The process of transcription

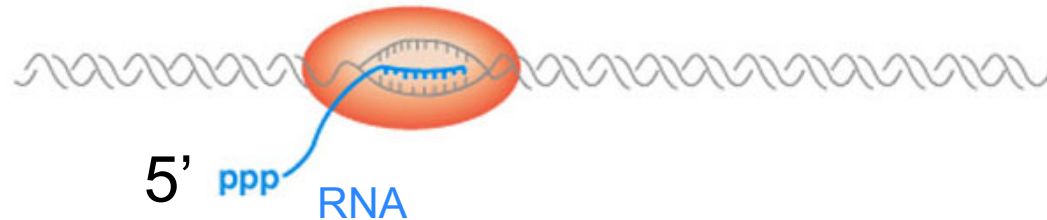


The three steps of transcription: initiation, elongation and termination

(1) Initiation:



(2) Elongation.



(3) Termination.



E. coli promoter

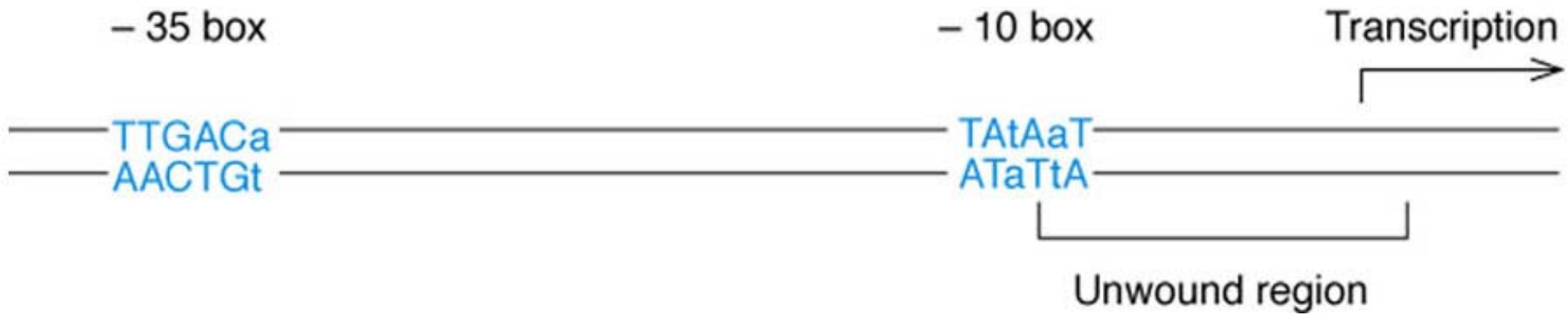
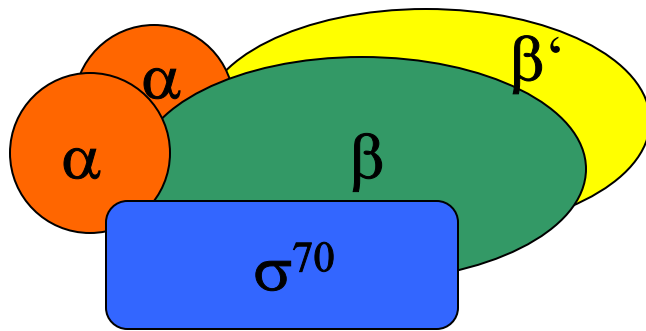


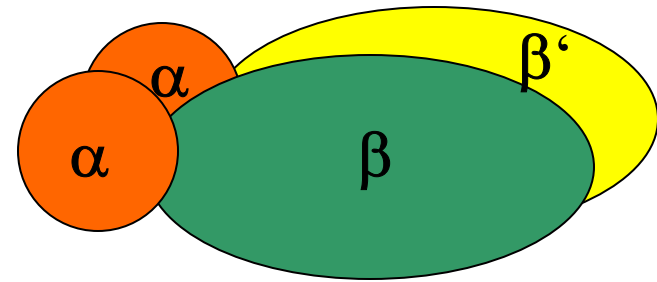
Fig. 6.6

- Clicker Question -

E. coli RNA polymerase

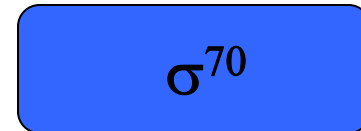


Holo-enzyme ($\alpha_2\beta\beta'\sigma$)



Core ($\alpha_2\beta\beta'$)

+



σ^{70}

Sigma factor is needed for promoter binding

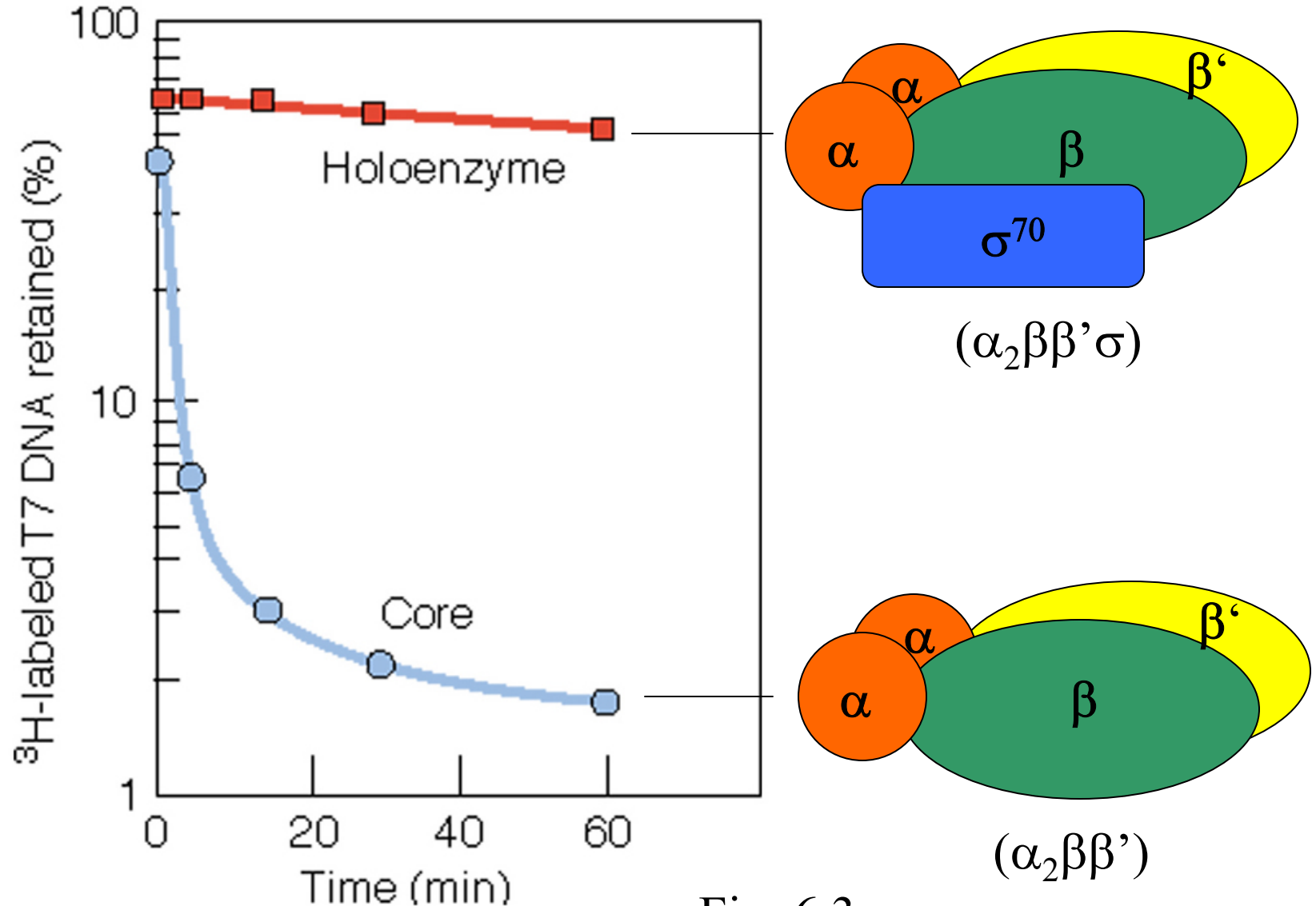
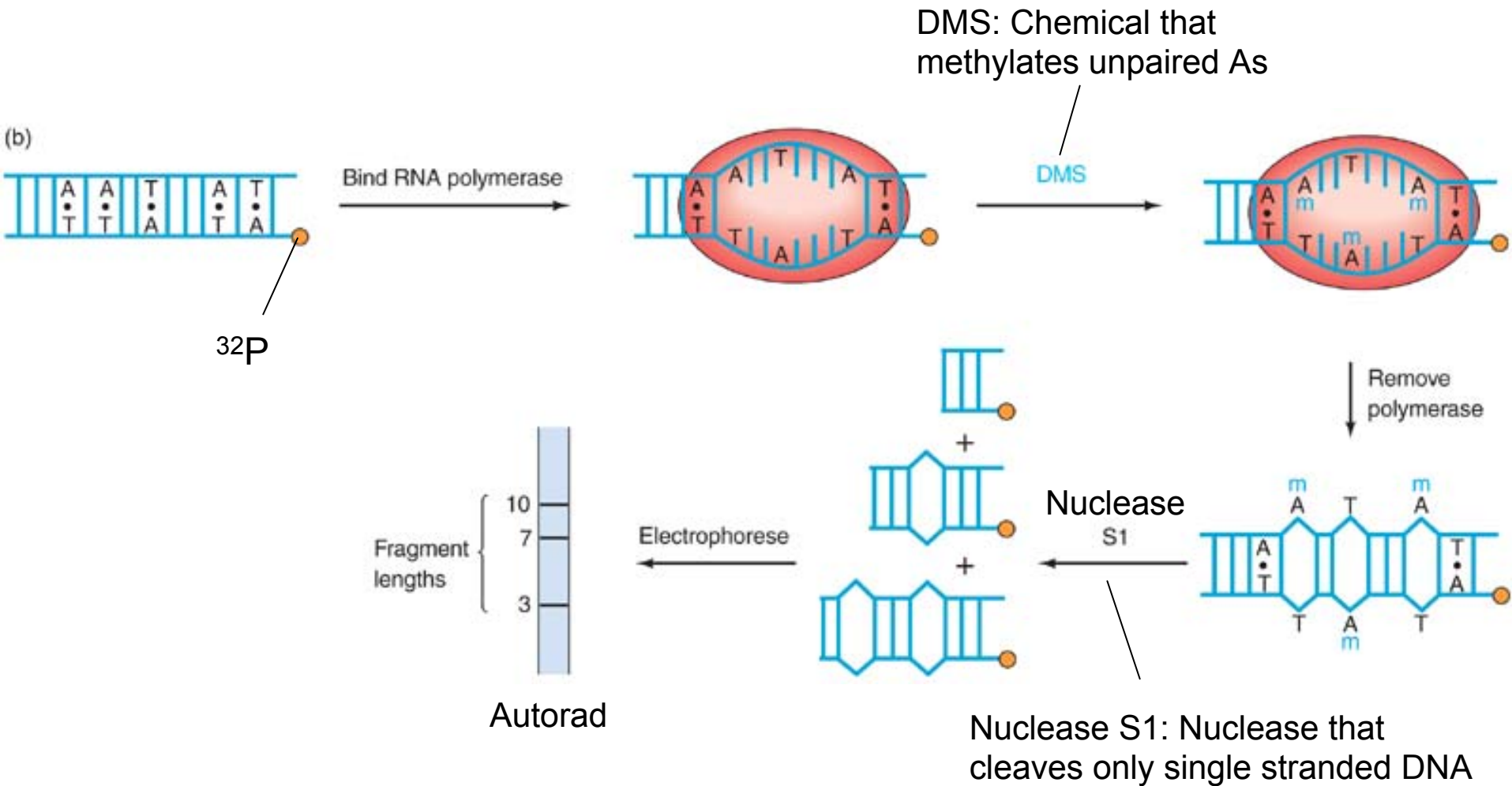


Fig. 6.3

Experiment to test whether the RNA polymerase melts the region around the transcription start site

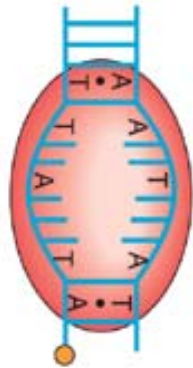


Technique: see DNase/DMS footprinting (Weaver Ch. 5, p. 116-119)

Fig. 6.16

Evidence that the RNA polymerase melts the region around the transcription start site

RNA polymerase:	+	+	-	-
Nuclease S1:	-	+	+	-
	R ⁺ S ⁻	R ⁺ S ⁺	R ⁻ S ⁺	GA



Melted region

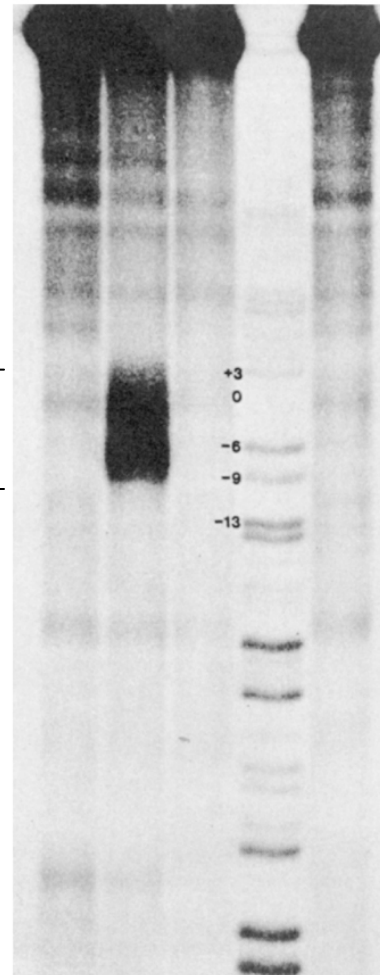


Fig. 6.17

- Clicker Question -

Evidence that the sigma subunit is reused

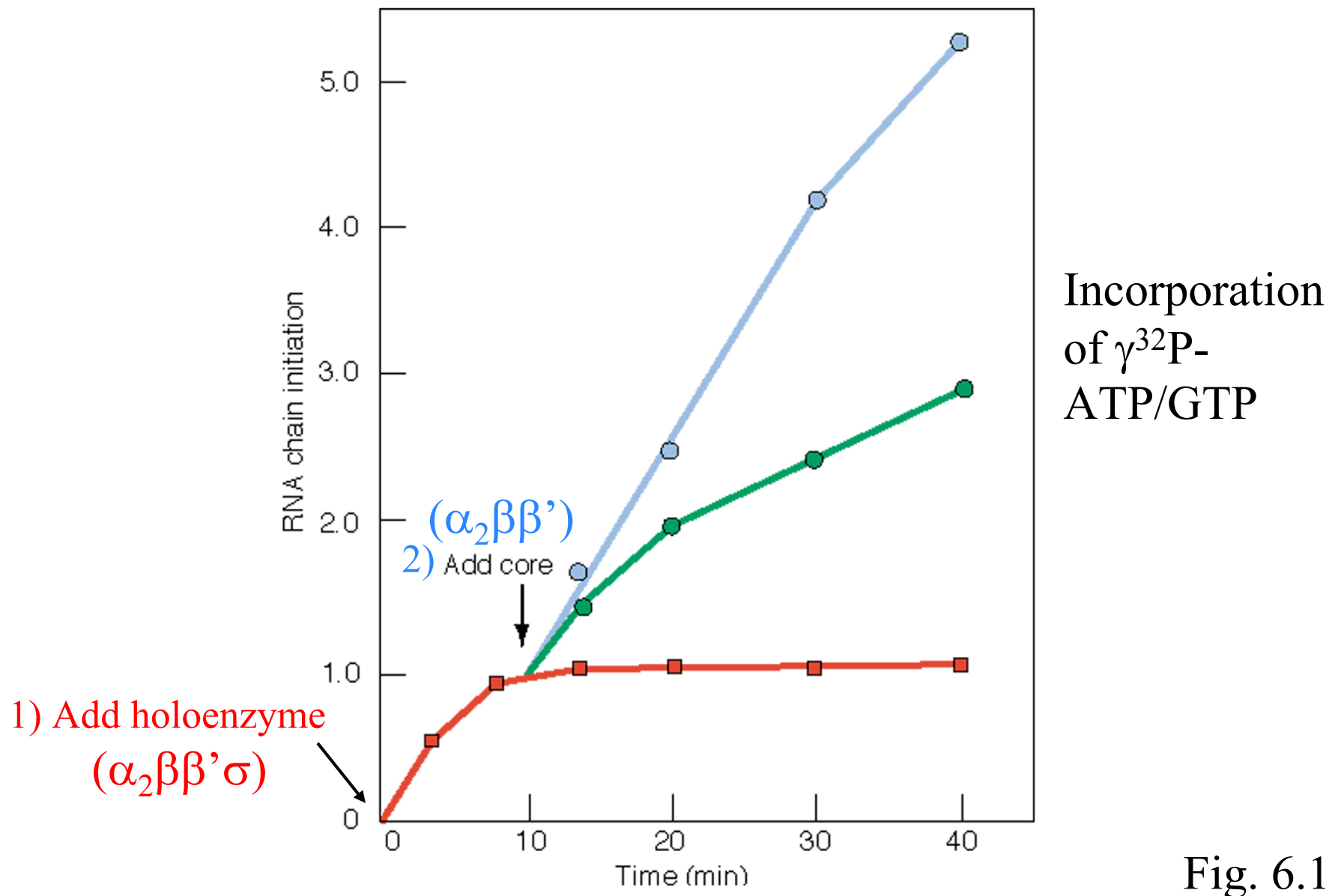


Fig. 6.11

Evidence that sigma stays bound during transcription elongation

leading-edge FRET

σ released; decreased FRET

σ no released; increased FRET

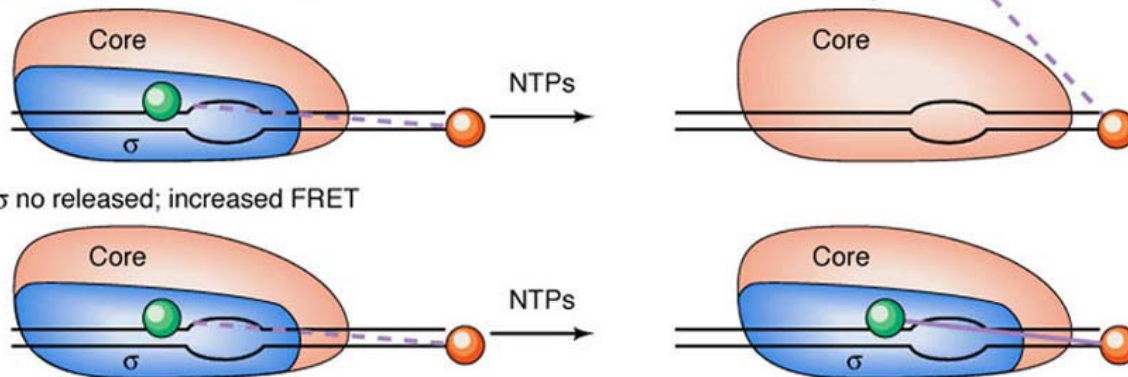


Fig. 6.13b

(b)

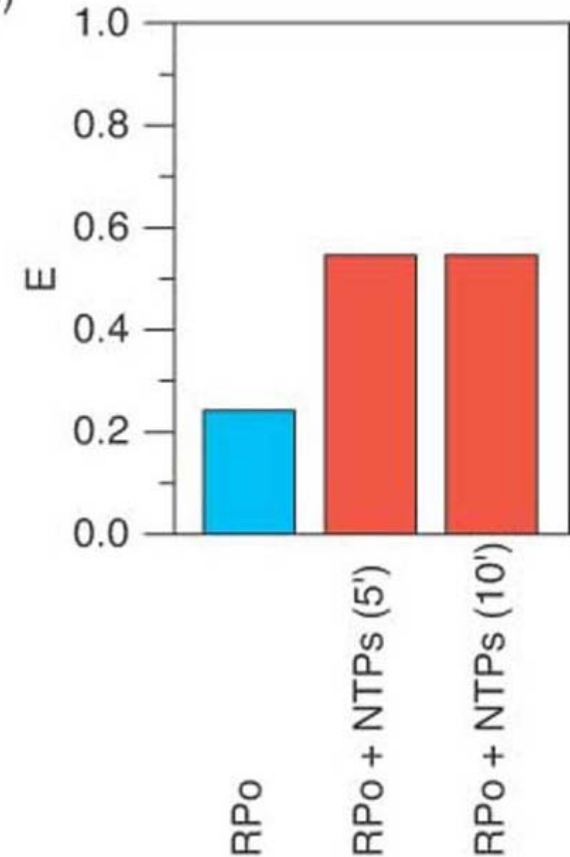


Fig. 6.14b

The steps of transcription initiation in bacteria

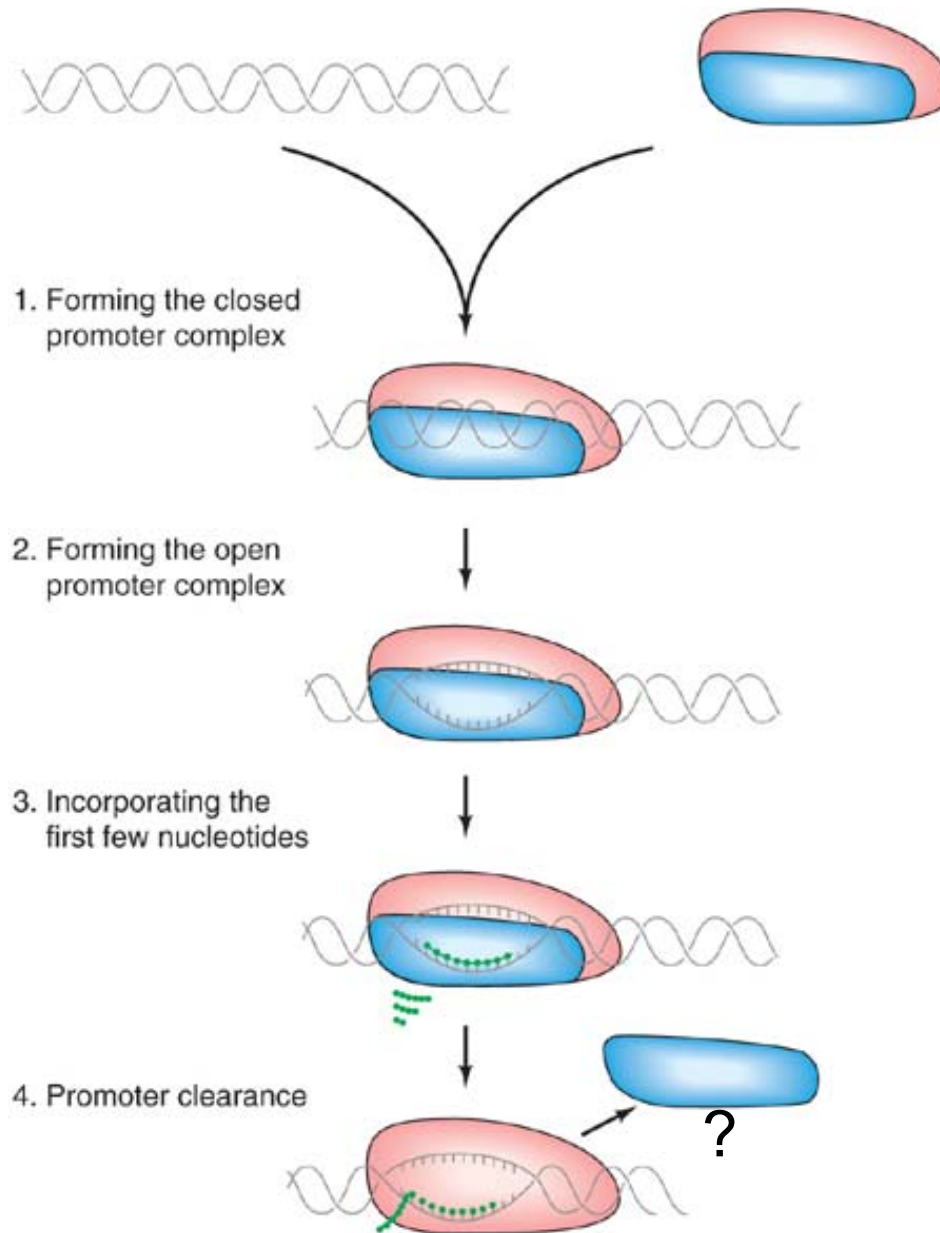


Fig. 6.9

The alpha subunit of RNA polymerase can bind upstream (UP) elements in strong promoters

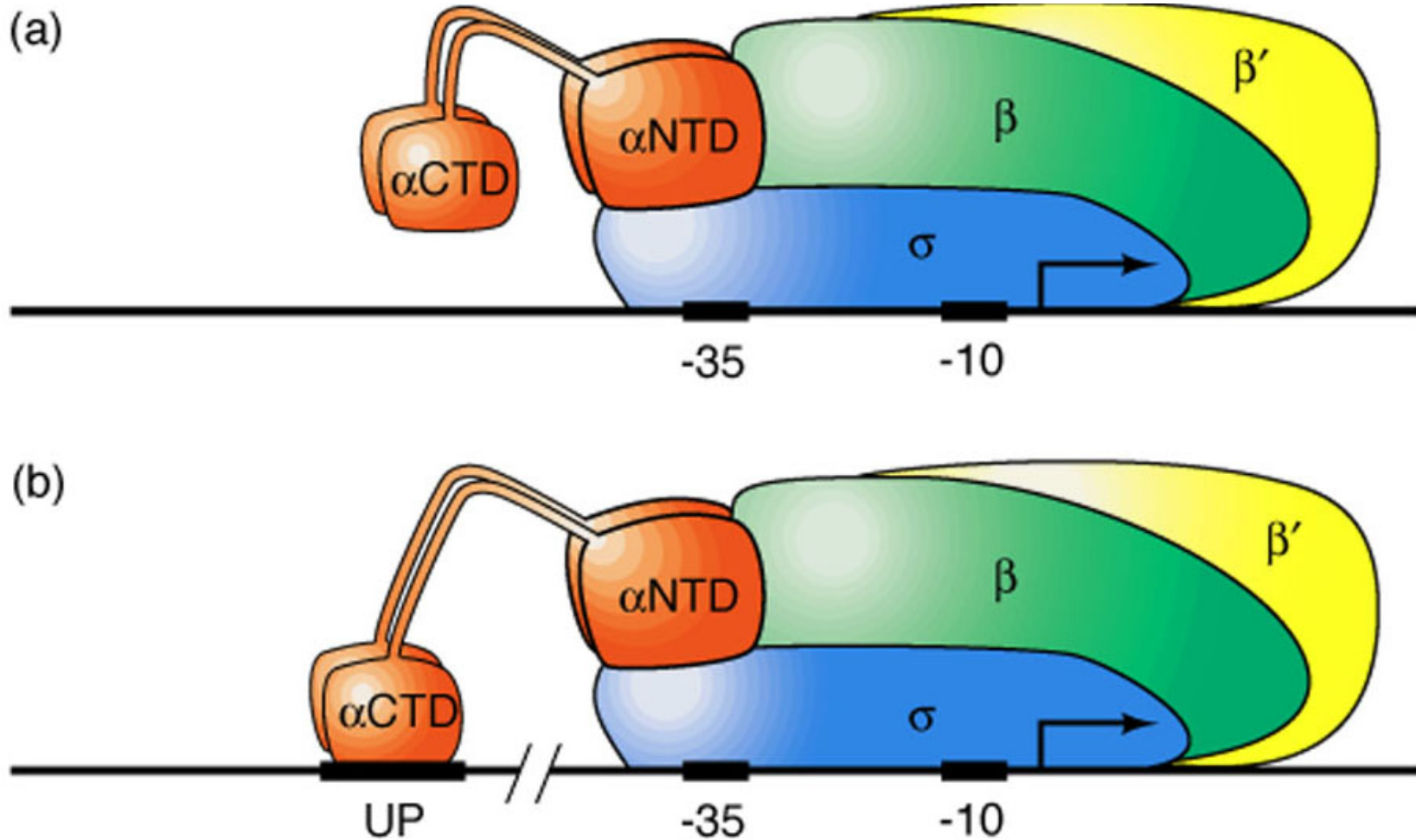
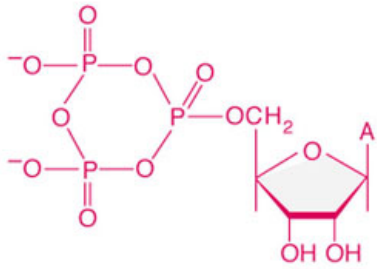


Fig. 6.26

(a)



Nucleotides cross-link to the RNA polymerase β subunit

(b)

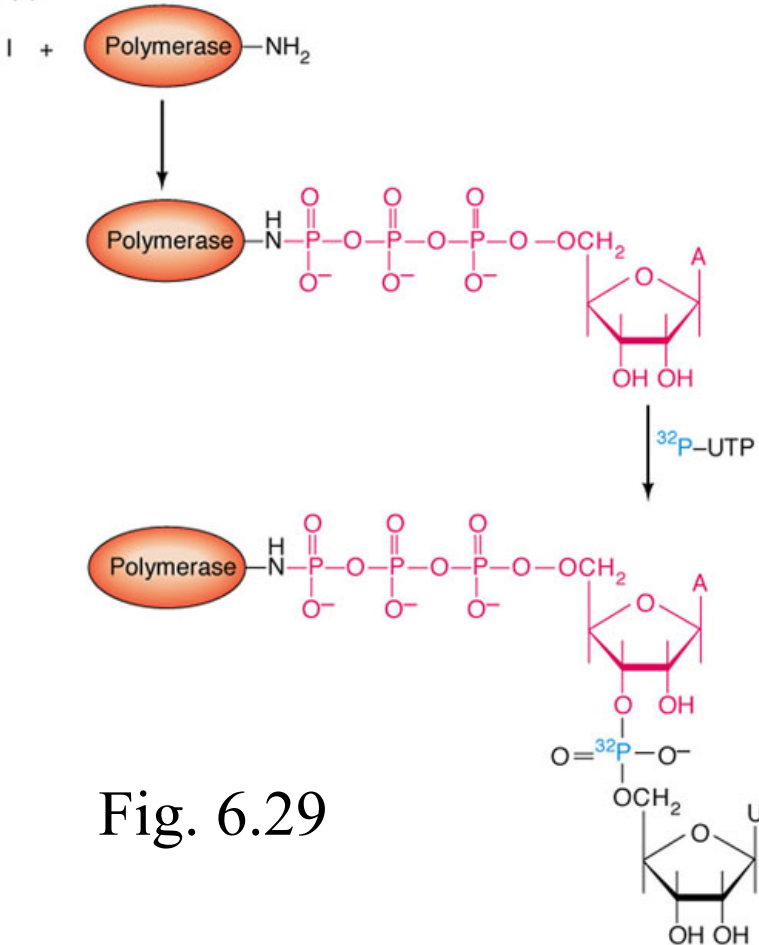
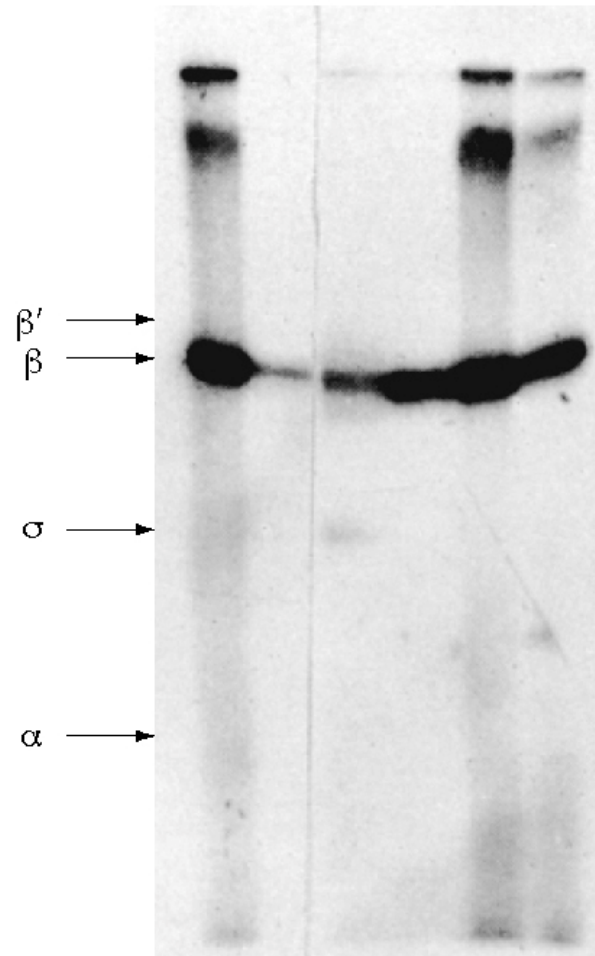


Fig. 6.29

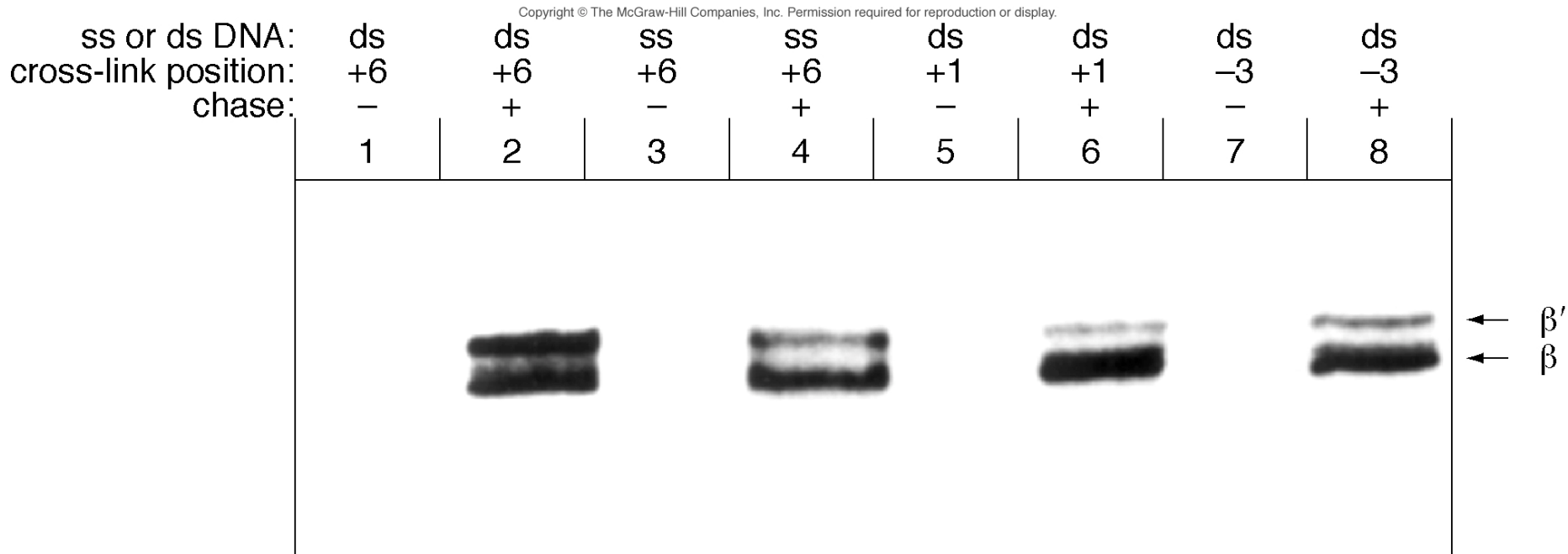
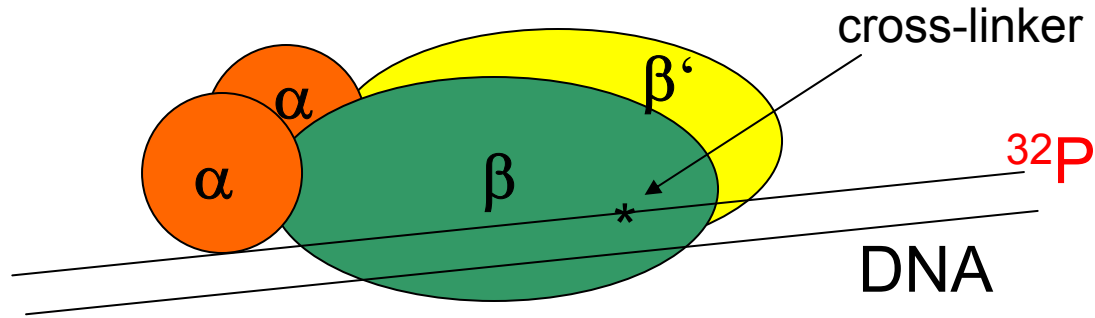
1 2 3 4 5 6



SDS-PAGE/
autorad

Fig. 6.30

Both β and β' subunits interact with DNA during transcription



(Source: Nudler et al., Transcription processivity: Protein-DNA interactions holding together the elongation complex. *Science* 273 (12 July 1996) f. 5c, p. 214. © AAAS.)

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Fig. 6.33

Model of the transition from closed (RP_c) to open (RP_o) promoter complex

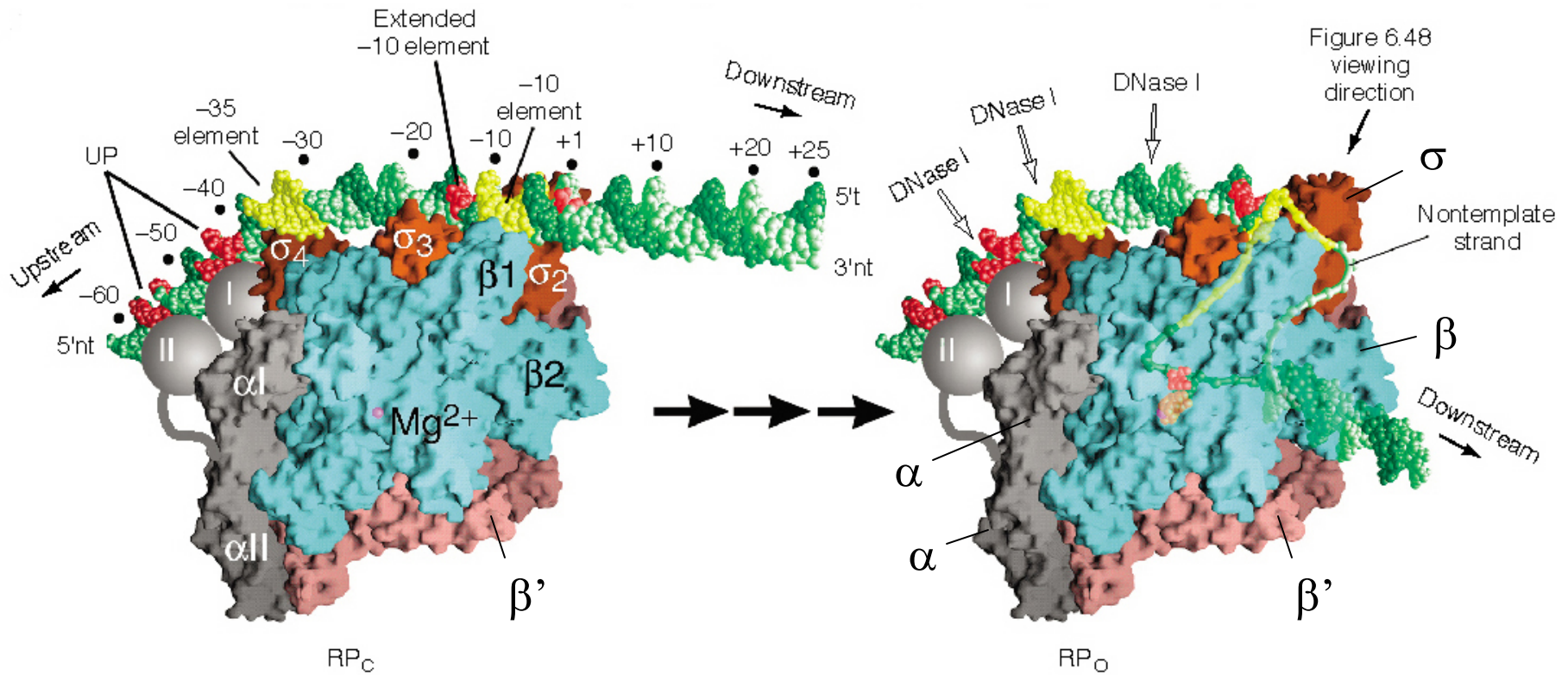


Fig. 6.43a

- Clicker Question -

- Clicker Question -

Model for Rho-independent (simple) transcription termination in bacteria

RNA 3' end of simple terminator:

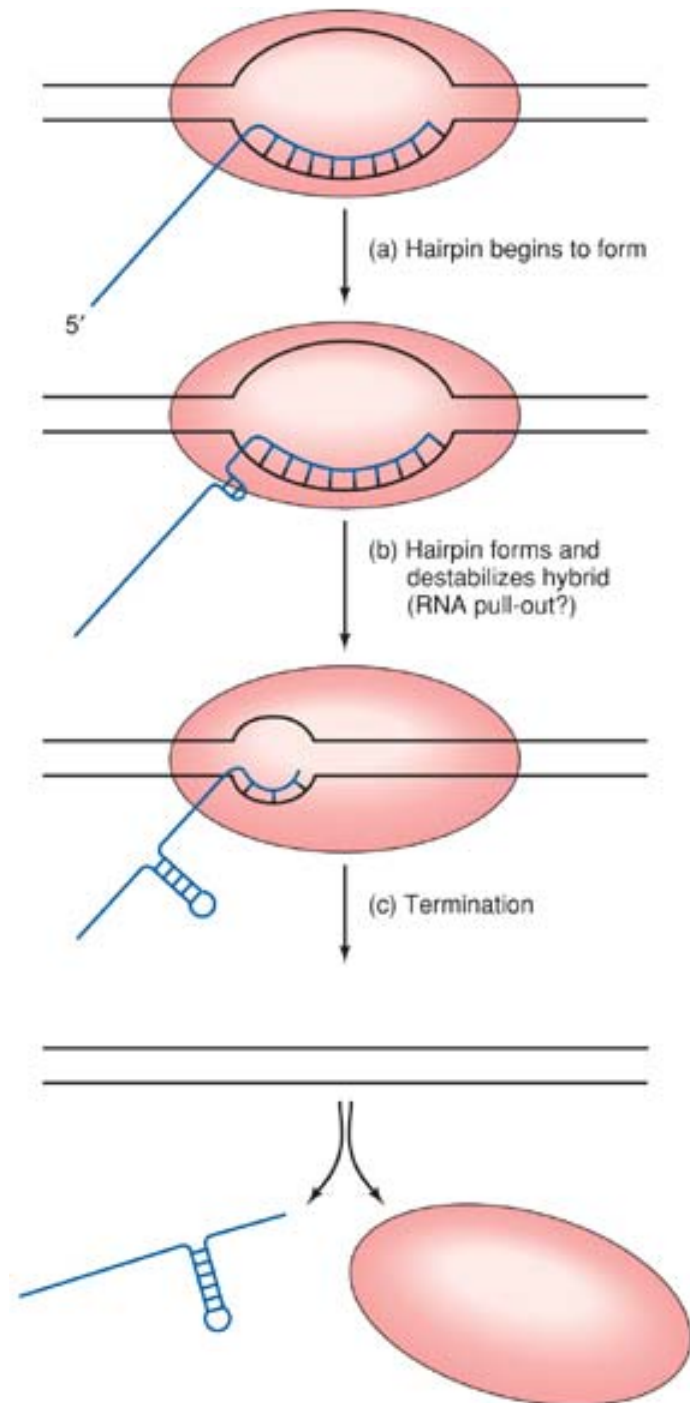
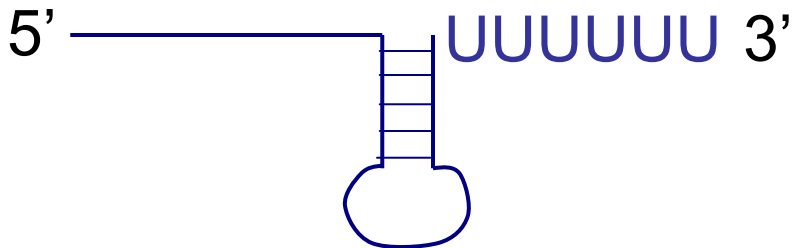
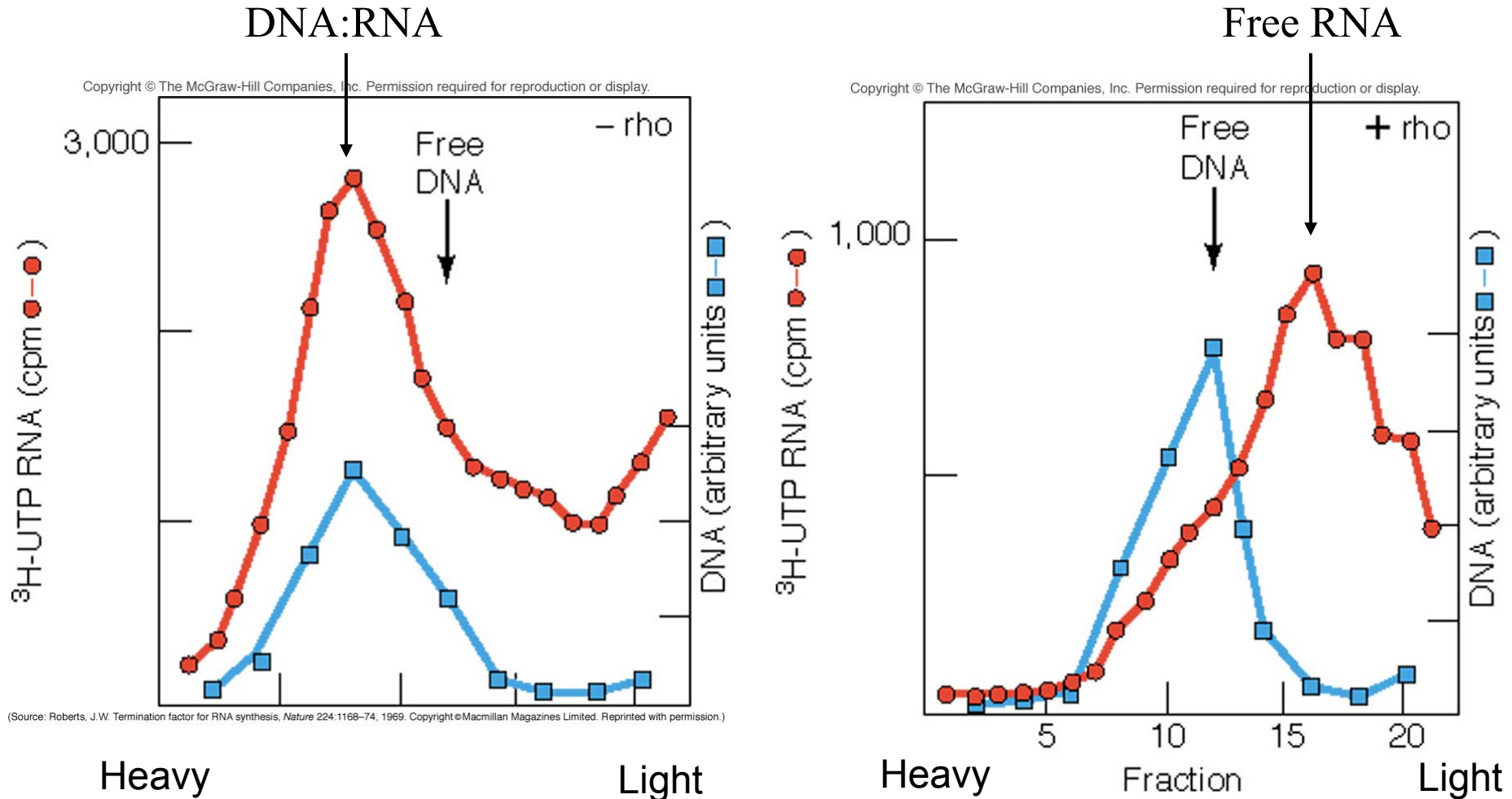


Fig. 6.46

Some terminators depend on the protein Rho

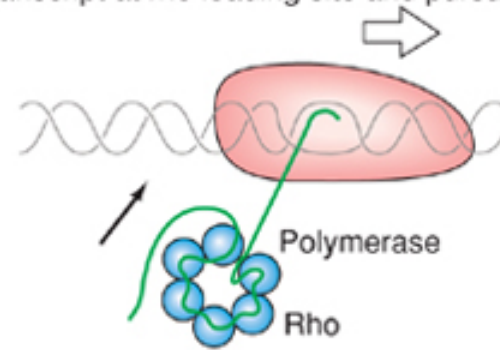


DNA/RNA separated in CsCl density gradients

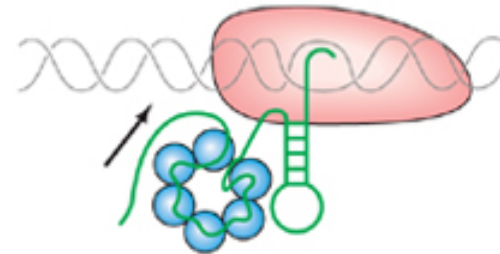
Fig. 6.50

Model for Rho-dependent transcription termination in bacteria

(a) Rho binds to transcript at rho loading site and pursues polymerase.



(b) Hairpin forms; polymerase pauses; rho catches up.



(c) Rho helicase releases transcript and causes termination.

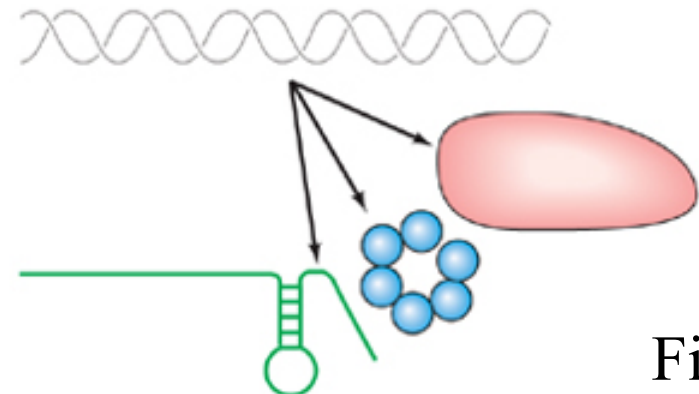


Fig. 6.51

- Clicker Question -