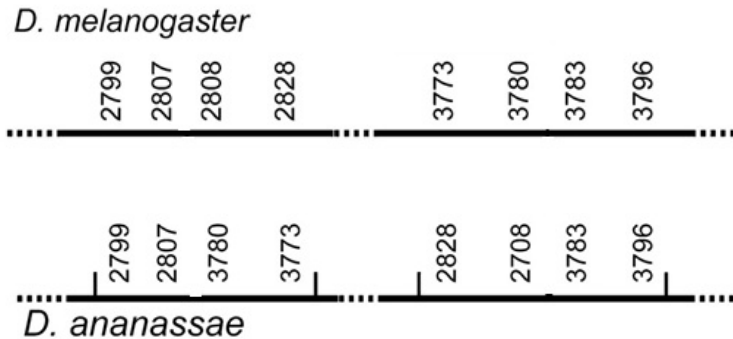


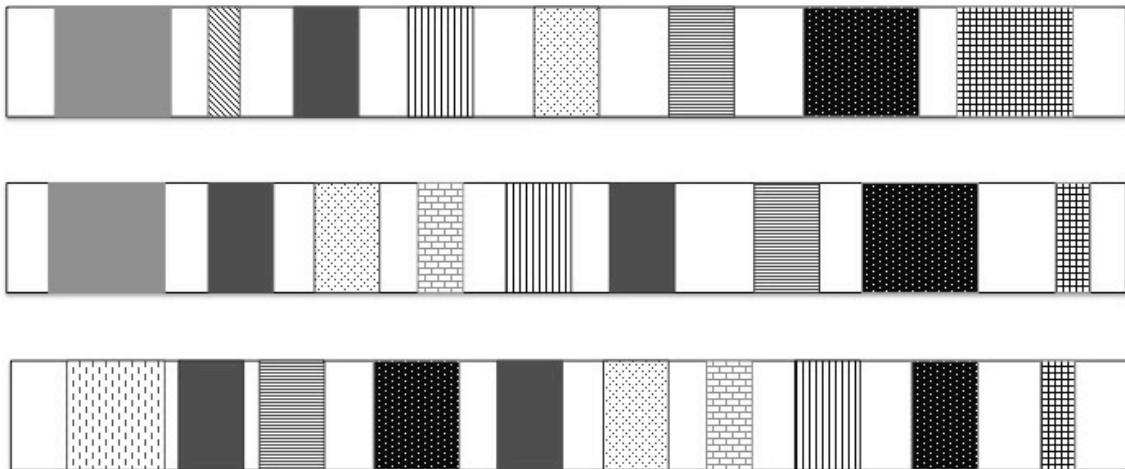
Gene Rearrangement Questions:

These are gene markers on chromosomes of different species of *Drosophila*. Can you identify the type of mutation that led to these changes?



Imagine a human protein containing 33 repeats of a simple domain arranged in tandem. In contrast, a homolog found in bacteria contains only one domain. What is the minimum number of duplication events that can account for the evolution of this protein since our divergence from bacteria?

Can you identify the rearrangements that led to the following blocks? Each gene is encoded with a color. Colored blocks are homologs.



The sequence of a region of DNA around the 5' end of a gene in *Escherichia coli* is shown below. The -10 hexamer and the transcription start site are highlighted. What would be the sequence of the first 10 nucleotides of the mRNA transcribed from this gene? Write down the sequence from 5' to 3', e.g. CGGAUAACT.

5'...GCGCTTGG**TATAAT**CGCTGGG**G**GTCAAAGAT...3'

Where are the cis and trans acting factors in this diagram?

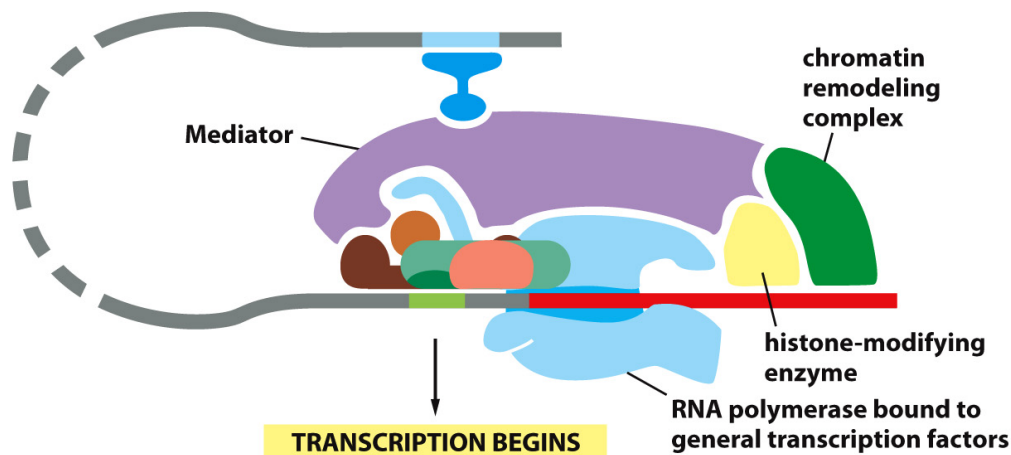


Figure 6-18 Molecular Biology of the Cell 6e (© Garland Science 2015)

The following mRNA sequence is taken from the middle of exon 3 in a mature mRNA that has 12 exons. Knowing that this mRNA does not undergo nonsense-mediated decay, which of the reading frames shown is the correct one for this mRNA? Write down 1, 2, or 3 as your answer.

5'...AGUGAUUCGAUACAGCUAGCGGACAGCUA...3'

Reading frames:

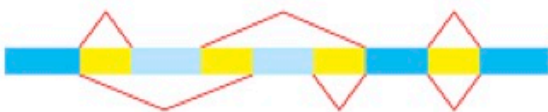
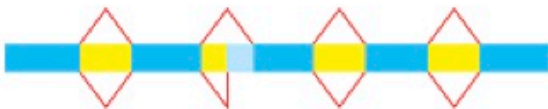
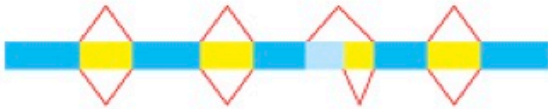
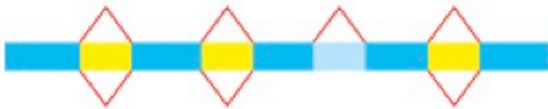
1	⎵ ⎵ ⎵ ⎵ ...
2	⎵ ⎵ ⎵ ⎵ ..
3	⎵ ⎵ ⎵ ⎵ ...

This is the first exon of the CFTR mRNA. What would this translate to?
(reminder translation starts at the first start codon)

```

guaccagauu  cugagcaggg  agaggcgaua  cugccucgca
ucagcgugau  cagcacuggc  cccacgcuuc  aggcacgaag
gaggcagucu  guccugaacc  ugaugacaca  cucaguuuac
caaggucaga  acauucaccg  aaagacaaca  gcauccacac
gaaaaguguc  acuggccccc  caggcaaacu  ugacugaacu
ggauauauau  ucaagaaggu  uaucucaaga  aacuggcuug
  
```

What types of splicing do these represent?



Codon Table:

		Second base				
		U	C	A	G	
First base	U	UUU } Phenyl- alanine F UUC UUA } Leucine L UUG	UCU } Serine S UCC UCA UCG	UAU } Tyrosine Y UAC UAA } Stop codon UAG } Stop codon	UGU } Cysteine C UGC UGA } Stop codon UGG } Tryptophan W	U
	C	CUU } Leucine L CUC CUA CUG	CCU } Proline P CCC CCA CCG	CAU } Histidine H CAC CAA } Glutamine Q CAG	CGU } Arginine R CGC CGA CGG	C
	A	AUU } Isoleucine I AUC AUA AUG } Methionine start codon M	ACU } Threonine T ACC ACA ACG	AAU } Asparagine N AAC AAA } Lysine K AAG	AGU } Serine S AGC AGA } Arginine R AGG	A
	G	GUU } Valine V GUC GUA GUG	GCU } Alanine A GCC GCA GCG	GAU } Aspartic acid D GAC GAA } Glutamic acid E GAG	GGU } Glycine G GGC GGA GGG	G
		Third base				