BIOMOLECULES

1st semester

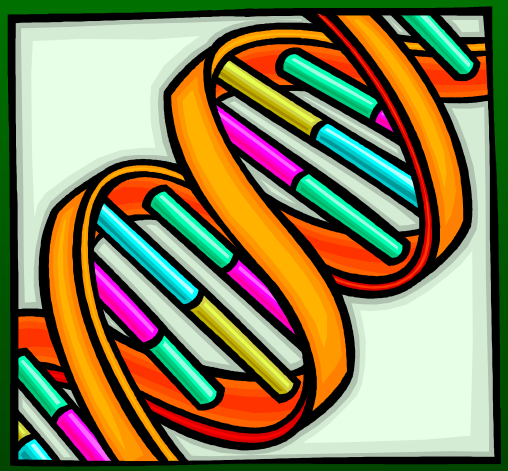
4th week

March 10th – 14th, 2008

Task 1, p. 107
Carry out replication of the following double-stranded DNA molecule:

5′ T T A A C G C G A T G G T C T 3′

3′ A A T T G C G C T A C C A G A 5′



Replication:

Result:

5´ T T A A C G C G A T G G T C T 3´
3´ A A T T G C G C T A C C A G A 5´

5´ T T A A C G C G A T G G T C T 3´
3´ A A T T G C G C T A C C A G A 5´

Task 2, p. 108

To the „coding“ strand of DNA of the following sequence:

5´ T T A A C G C G A T G G T C T 3´

form: a) „noncoding“ strand of DNA

b) mRNA

c) polypeptide

Solution:

a) noncoding strand of DNA

3′ A A T T G C G C T A C C A G A 5′

b) mRNA

5′ UUA ACG CGA UGG UCU 3′

c) polypeptide

Leu – Thr – Arg – Trp – Ser

Task 3, p. 109

Carry out translation of the fictive circular mRNA.

a)

met 9lys asn glu 9lys

b)

(met 9phe tyr val 8phe leu cys 9phe)$_\infty$

c)

(met 9pro his ala 9pro cys 9 pro)∞

d)

(met 9gly asp 10gly trp 9gly)∞

Task 4, p. 109

	UUU	2/3 x 2/3 x 2/3 = 8/27
U:C	UUC CUU UCU	2/3 x 2/3 x 1/3 = 4/27
2:1	CCU CUC UCC	2/3 x 1/3 x 1/3 = 2/27
	CCC	1/3 x 1/3 x 1/3 = 1/27

phe = UUU + UUC = 8/27 + 4/27 = 12/27

ser = UCU + UCC = 4/27 + 2/27 = 6/27

leu = CUU + CUC = 4/27 + 2/27 = 6/27

pro = CCU + CCC = 2/27 + 1/27 = 3/27

Task 6, p. 110

DNA sequence:

5′ A G G A T A T G T T A C T C T A A A C A T 3′

a) 7 molecules of tRNA

b) anticodons:

$^{3'}$UCC$^{5'}$ $^{3'}$UAU$^{5'}$ $^{3'}$ACA$^{5'}$ $^{3'}$AUG$^{5'}$ $^{3'}$AGA$^{5'}$ $^{3'}$UUU$^{5'}$ $^{3'}$GUA$^{5'}$

Task 7, p. 110

Consider a following tripeptide:

NH_2 – Met – Glu – Trp – COOH

DNA sequences:

5′ ATG GAA TGG 3′
3′ TAC CTT ACC 5′

5′ ATG GAG TGG 3′
3′ TAC CTC ACC 5′

DEGENERATION OF GENETIC CODE

In the rat, a mutation causing cataract (eye lens opacity was identified. The mutation is inherited in autosomal semidominant manner, homozygotes have microphthalmia with severe lens reduction. Using linkage mapping, a DNA segment containing the mutation was nailed down. Here you can download the mutated sequence, here the normal sequence. Determine:

f)Differences between the sequences.

g)Which sequence variant can be the mutation? (find open reading frame and compare the polypeptides)

h)Is this finding relevant for human pathology? (which gene is mutated, what is the function of this gene, is there an ortholog in human genome?)

Instructions on our web here.