Life and Earth Sciences: Molecular Genetics and Genetic Engineering

1) Translate the following sequence to protein

ATGGATAAAGAATTTTGGGATATT

2) Find a mutation resulting in (give in each case the resulting DNA, and the RNA and protein sequences):

a) Generation of a truncated protein (Stop codon)

b) Substitution of an aminoacid

c) Change in the reading frame

d) Generation of a restriction site for one of the enzimes described (see the Data sheet), with no changes in the protein sequence.

3) From the sequence below, identify the restriction sites and decide which would you use to isolate the gene (underlined).

GGGATCC CCATC**<u>GAAGGTTTCCAGAATTCCGGGCCCCTGATCGAA</u>**CGTGAGGTCGACTAG

4) Construct DNA palyndromic sequences from this sequence fragments:

ATT	GAA	ATC	TGA

4) In the following table, you have represented the amount of nucleotides appearing in samples of nucleic acids. **Determine if it belongs to DNA, RNA, and if it's more likely to be single stranded (ss) or double stranded (ds).** Mark it by selecting the correct cells on the right.

	A	G	C	U	T		RNA	DNA	ss	ds
Sample 1	30	10	30	30	---					
Sample 2	20	30	30	---	20					
Sample 3	40	10	20	---	30					
Sample 4	22	28	28	22	---					
Sample 5	15	35	35	---	15					

5) The inverse exercise: **propose results for the content of A, C, T, G, U**, expectable from the types of nucleic acid showed next.

	A	G	C	U	T		RNA	DNA	ss	ds
Sample 1	25	20	20				√		√	
Sample 2	18	32						√		√
Sample 3		30			20			√	√	
Sample 4							√			√
Sample 5								√		√

6) **Associate the exercises of your exam to concepts of the topic**. Put each letter to its number.

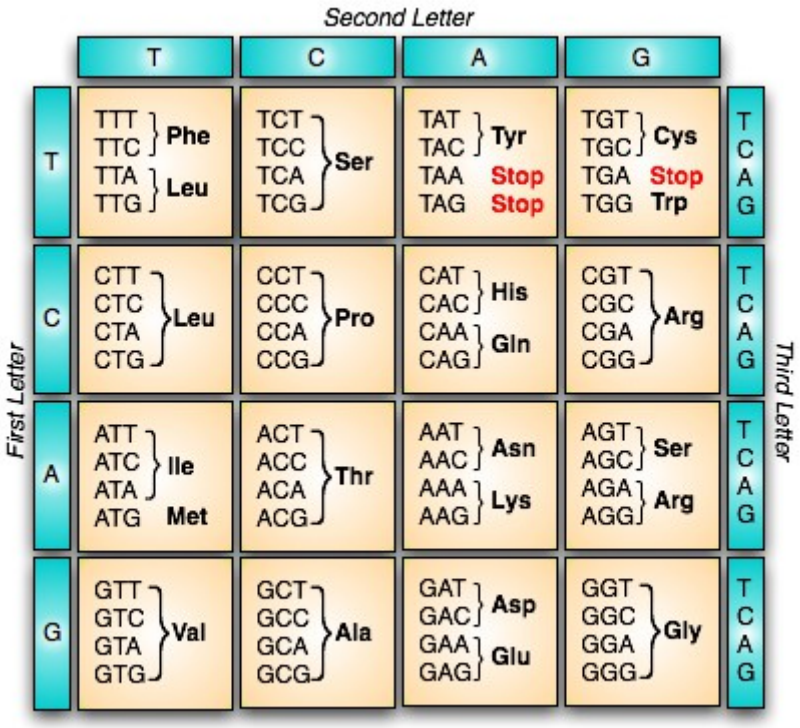
a) The first exercise relies on the translation of information contained in the DNA to RNA, and after to a protein. This process is described by the central Dogma of Molecular Biology.

b) Exercise 2 asks you to perform a procedure of genetic engineering.

c) The tables in exercises 4 and 5 reproduces a famous experiment from the researcher Erwin Chargaff. Select from the following elements which discoverings and researchers are related to this experiment.

1) Techniques of Gene Therapy
2) Niremberg and Khorana
3) Discovering of restriction enzymes
4) Frederick Sanger
5) Heterologous synthesis and transgenics
6) Description of the structure of DNA
7) Discovering of the genetic code
8) Watson, Crick, and Wilkins

DATA


Second Letter
T
C
A
G
First Letter
Third Letter
T
C
A
G
TTT TTC Phe
TTA TTG Leu
TCT TCC TCA TCG Ser
TAT TAC Tyr
TAA Stop
TAG Stop
TGT TGC Cys
TGA Stop
TGG Trp
CTT CTC CTA CTG Leu
CCT CCC CCA CCG Pro
CAT CAC His
CAA CAG Gln
CGT CGC CGA CGG Arg
ATT ATC ATA Ile
ATG Met
ACT ACC ACA ACG Thr
AAT AAC Asn
AAA AAG Lys
AGT AGC Ser
AGA AGG Arg
GTT GTC GTA GTG Val
GCT GCC GCA GCG Ala
GAT GAC Asp
GAA GAG Glu
GGT GGC GGA GGG Gly


GGG ATC CCC AGG AAT TCC CGG GTC GAC TCG AGC GGC CGC
BamH I
EcoR I
Sma I
Sal I
Xho I
Not I