Tell briefly but clearly two roles of SDS in the lysis buffer used for DNA extraction? 3 pts

1 - . . . . . .

2 - . . . . . .

Explain two characteristics of a plasmid vector in molecular biology (tell the importance of each). 3 pts

1- . . . . . .

2-. . . . . .

Define the histone code (in the context of regulation of gene expression). 4 pts

. . . . . .

How many bands are visualized when a:

-total RNA sample is sorted on an agarose gel and stained with ethidium bromide? Justify briefly. 2.5 pts

. . . . . .

-mRNA sample is sorted on an agarose gel and stained with ethidium bromide? Justify briefly. 2.5 pts

. . . . . .

Fill in the blank (1.5 pts each):

-A mRNA sample is ready. One needs the enzyme . . . . . to start the first step in cDNA library preparation.

-In an experiment of labelling by nick translation, one needs a DNA polymerase and . . . . . in addition to the necessary reagents and buffer (dNTP and alpha ^{32}P dCTP).

-To perform low density labelling . . . . . and kinase are required in addition to gamma ^{32}P ATP.

- . . . . . is a gene regulatory protein that acts as splicing repressor in the mechanism responsible for sex determination in drosophila.

-To determine position of a cis element in a cloned promoter, the technique of . . . . . is performed.

-An example of non-detergent denaturing agent used during cell lysis is . . . .

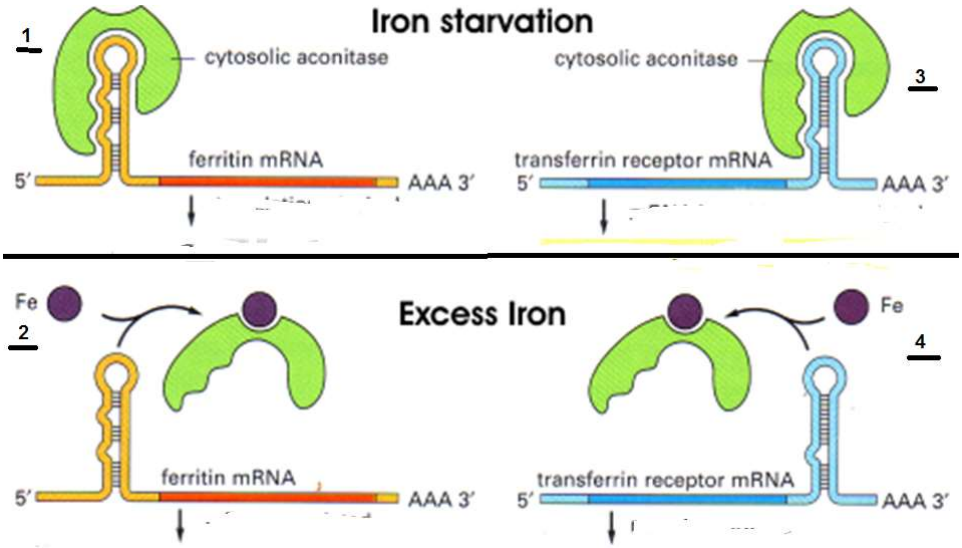
-The ratio of OD 260nm/OD 280nm for a nucleic acid sample informs about its quality in terms of . . . . . .

-Gene regulatory proteins usually consist of . . . . . and a domain that interacts with the transcription machine.

-An enhancer may be located far from +1 of a certain gene, however, its effects is restricted to that gene (not on neighboring genes) due to . . . . . sequence.

-The interfering RNA response involves . . . . . which generates siRNA and . . . . which is guided by the siRNA to the target RNA that will be degraded.
-Spreading of chromatin condenstation from a chromatin domain to a neighboring one is prevented by . . . . sequences.
-Nucleic acid hybridization between a probe and its target depends on temperature and . . . . . concentration which, together, define the solution stringency.
-The translation rate of a certain protein in a cell can be determined by pulse-chase using radioactive leucine followed by . . . . . .
-Two proteins that repress each other synthesis can mediate a stable state of . . . . . .
-A 1kb circular supercoiled DNA molecule migrates . . . . . to 1kb linear DNA molecule in an electrophoresis agarose gel.
-Actinomycin-D is a drug which inhibits the enzyme . . . . . This drug is helpful to investigate mRNA stability.
- . . . . . can be investigate by the run-on in vitro transcription

In each of the four situations depicted in the figure (numbered 1 to 4), tell the output in terms of mRNA stability and translation rate and justify briefly. 8 points



1- . . . . . .
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2- . . . . . .
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3- . . . . . .
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4- . . . . . .
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. . . . . .

Give two features of a module found in eve gene promoter. 3 pts

1- . . . . . .
. . . . . .
. . . . . .
2- . . . . . .
. . . . . .
. . . . . .

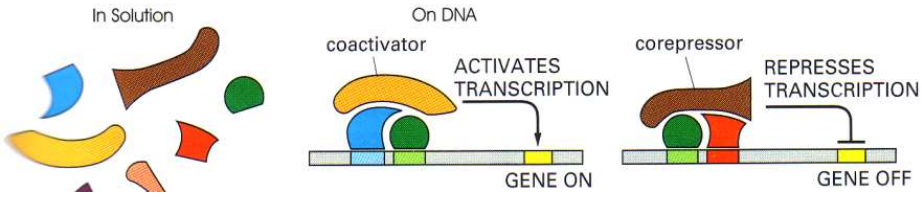
Using complete and explicit sentences, list in the logical chronological order the steps of DNA fingerprint by the Jeffrey's method starting from "a pure genomic DNA sample" till "bands visualization". 6 pts

1-
2-
3-
4-
5-
6-
7-
8-
9-

Explain how to delete the underlined nucleotide (ATCGATCCTATTAAC); knowing that this sequence belongs to a cloned DNA inserted in a plasmid. 4 pts

Give a title to this figure. Comment it regarding the role (effect) of gene regulatory proteins in eukaryotes. (5 pts) .
Title:

Comment:



Explain two possible mechanisms that cause an intron or an exon to be skipped during alternative splicing. 4 pts
1st:

2nd:

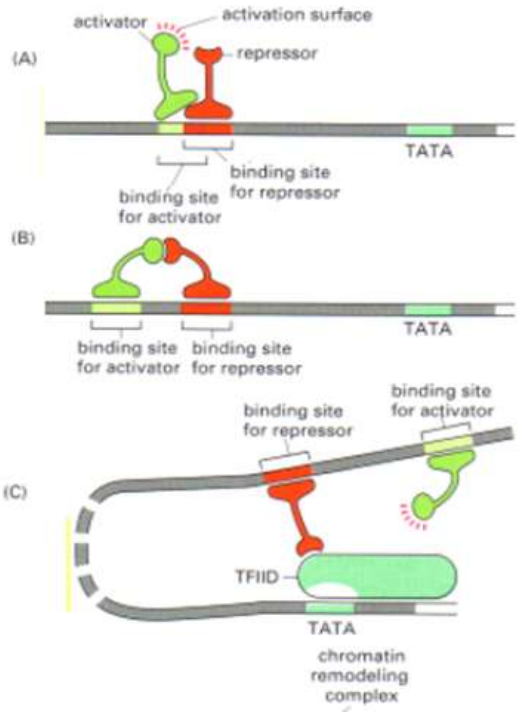
Give a title to the following figure and briefly explain each part. (6 pts)

Title: . . . . . .

A- . . . . . .

B- . . . . . .

C- . . . . . .



-Name four types of DNA binding motifs in gene regulatory proteins 4 pts

1- . . . . . .

2- . . . . . .

3- . . . . . .

4- . . . . . .

Briefly explain two different modes of control GRP (gene regulatory proteins) activity. 3 pts

1- . . . . . .

2-. . . . . .

Briefly explain two main features the interfering RNA response. 3 pts

1- . . . . . .

2-. . . . . .

Diverse gene regulatory proteins may have an HTH as a DNA binding motif. Do they bind to the same cis element? Explain 5 pts

. . . . . .

Protein interaction with DNA is strong and highly specific. Justify 5 pts.

Briefly explain two main consequences of the change of the cleavage and termination sites of a certain mRNA. 3 pts

1-

2-