-Tell in form of explicit sentences two characteristic properties of RNA that are helpful during an experiment of nucleic acid extraction (be clear regarding the interest of each property during extraction). 4 pts

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-Draw one single line to match each enzyme (column 1) with one single relevant property (from column 2). Each property in column 2 must be used, but only once. 5 pts

Column 1	column 2
Micrococcal DNase	DNA foot printing experiment
DNase I	200bp ladder after chromatin mild digestion
BAL31 nuclease	exonuclease
Ligase	endonuclease
EcoR I	catalyze phosphodiester bond formation

-Name two deproteinization methods during nucleic acid extraction. 3 pts

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-Give in form of complete sentences the steps of cDNA library preparation (note: if there is one mistake in the logical successive order of steps the score will drop by 50%). 4 pts

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-To a cloned DNA we add DNA polymerase I, alpha 32P-dCTP, dNTP. The labelling reaction is performed in optimal conditions of temperature, pH, concentration and time and we are sure about quality of the enzyme. However, the cloned DNA remained unlabeled. Justify. 3 pts

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-Name three different techniques that help determining the genotype of an individual in a certain specific gene. 4.5 pts

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-How does a partial peptide sequence of a protein help in an experiment of cDNA cloning without library preparation? 3 pts

-Briefly explain the main advantage of real-time PCR relative to classical PCR? 3 pts

-What is the nature and characteristic feature of the gel that we use to sort molecules by the end of a nucleic acid sequencing reaction? Justify 3 points

-Write two meaningful sentences about the relationship of histone acetylation and gene expression regulation. 3 pts

-Name three distinct/different techniques that help investigating the relative amount of a certain RNA. 3 pts

-In an experiment of DNA fingerprinting the used enzyme prior to southern blot is DNase I. Justify briefly but clearly if this is true or false (do not explain the steps of DNA fingerprinting nor those of Southern blotting). 3 pts

-To check the localization of a certain specific mRNA in the cytosol, the use of a light microscope (without any other tool or technique) is sufficient. Justify briefly but clearly if this is true or false. 3 pts

-In an EMSA experiment, what are the two tools that help identifying the protein which is bound to the oligonucleotide? (Be very explicit in your answer for each tool): 3 pts

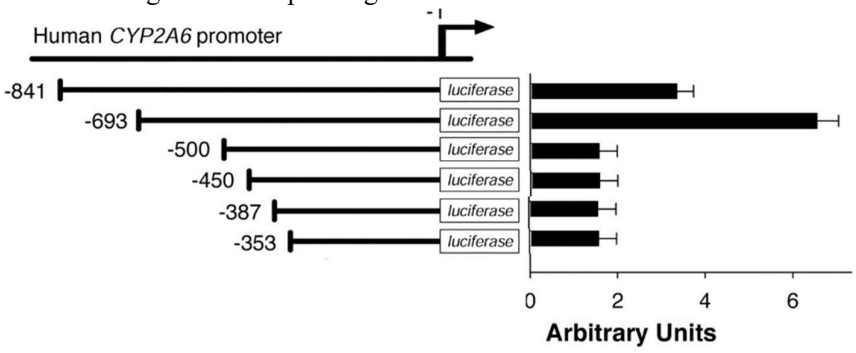
-Briefly explain how to sort two protein types if they have the same molecular weight (no technical details required, the concept is sufficient). 3 pts

Match by drawing only one line to match each keyword (column 1) with <u>one single</u> relevant idea (from column 2). 5 pts

Column 1	column 2
Western blotting	deletion of a specific codon from a certain cDNA
Site directed mutation	determination of the relative amount of a specific protein type
Screening tool of a plasmid	necessary for vector linearization prior to DNA insertion
Multiple cloning sites	identifying vector containing insert
Run-off in vitro transcription	Cloning of a certain specific RNA

-Tell two main characteristics of a reporter gene that may be used to assess activity of a certain gene promoter. 3 pts

-CYP2A6 promoter constructs in front of luciferase gene as a reporter gene were tested after transfection into the appropriate cells. Luciferase activity was assessed (see figure). Identify three zones (Define them using the scale in bp) of the promoter which play different roles in terms of regulation of CYP2A6 gene expression. 5 pts



-Clearly tell three main characteristic features of an enhancer sequence (other than its ability to activate transcription). 3 pts

Transcription of a certain gene by RNA polymerase II is always terminated at the same site leading to the same 3' end of the mRNA. Justify briefly but clearly if this is true or false. 3 pts

-Briefly tell the general function of Sxl protein in the process of drosophila sex determination (you are not supposed to explain the full example). 3 pts

-Other than the NPC components, name three actors that are involved in mRNA translocation from the nucleus to the cytosol. 3 pts

-A mature mRNA is randomly localized in the cytosol of a eukaryotic cell. Justify briefly but clearly if this is true or false. 3 pts

-Clearly tell three distinct roles (in terms of regulation of gene expression) of regulatory sequences (cis elements) in the 5'UTR. 4.5 pts

-Other than alternative splicing, give the names (in form of clear and complete sentences) of two mechanisms that enable production of two polypeptide chains having different sizes from the same gene. 3 pts

-Degradation of a mRNA involves necessarily decapping or deadenylation. Justify briefly but clearly if this is true or false. 3 pts

-Tell in form of clear sentences three distinct properties of an antisense RNA. 4.5 pts

-Antisense RNA are synthesized by replicases only. Justify briefly but clearly if this is true or false. 3 pts

Non-coding RNA act to control mRNA translation only. Justify briefly but clearly if this is true or false. 3 pts