2021 Final Exam -spring-

Plant biotechnology questions

1. Describe and characterize the levels of eukaryotic genetic regulation, factors of transcription initiation of nuclear genes; steps of hnRNA processing! Introduce the cis elements influencing mRNA stability and degradation mechanisms of mRNA!

2. Describe and characterize the components of the plant genome! Describe and characterize the structure of the nuclear genome, and cpDNA and mtDNA! Give examples of traits encoded by cp and mtDNA!

3. Describe the changes in chromosome structure (deletion, duplication, inversion, translocation, transposition) and changes in chromosome number (the concept of ploidy and basic genomes).

4. Define the term of gene, genetics, reverse and forward genetics, genomics, functional genomics! Describe the structure of eukaryotic protein coding genes!

5. What are the most important methods of functional genomics, gene isolation and mutagenesis?

6. List the agronomical traits currently available for modification in pest resistant transgenic plants: and evaluate in detail (e.g. list and mode of action of useful genes, practical results, advantages and risks, etc.)!

7. List the agronomical traits currently available for modification in herbicide resistant transgenic plants: evaluate in detail (e.g. list and mode of action of useful genes, practical results, advantages and risks, etc.)!

8. Describe the novel genome editing methods (ZFN, TALEN, CRISPR/CAS9) for targeted gene modification in plants!

9. Describe the basic PCR technique! What purposes the PCR technique can be used for in plant molecular genomics and breeding?

10. Describe and characterize the most important DNA marker systems and their application! Introduce the conditions, methods and application of marker assisted selection (MAS)!

11. What is the importance of haploid plants in the case of out- and self-pollinated cereals? Describe the most important in vitro methods of haploid induction (anther and microspore culture). What are the well-known practical results using haploids in cereal breeding?

12. Discuss the importance and methods of germplasm conservation for plant breeding including major gene banks! Describe the methods for characterizing the domestication process and the genetic variability!

13. Describe the different pathways of micropropagation (somatic embryogenesis, organogenesis, meristem culture)!

14. Describe the tasks, the processes and sources of plant breeding! Classify the plant breeding technologies!

15. Compare the first and second generation sequencing methods, list their main characteristics! Describe the Roche 454 pyrosequencing method! Describe the characteristics of SNP markers! How does the Illumina Golden Gate SNP genotyping function?

Gödöllő, 11. 04. 2021.

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