

المستوي الرابع / برنامج البيولوجيا الجزيئية  
مقرر: تقنية جينات و تقسيم جزيئي (ح410)

Date: 27-05-2023

Time: 2 Hours

Marks: 90

الإمتحان في صفتان:

Answer the following questions:

(20 Marks)

**QUESTION (1):**

Answer the following:

(A) Which of the following statements are probably true (✓) and which are probably false (x).

**DO NOT copy the sentences to your answer sheet**

- 1- Recombinant insulin was first produced in yeast.
- 2- Looking at a phenotype and then trying to identify the gene responsible for it is called reverse genetics.
- 3- If a transgene is incorporated into the host's germline cells, it may or may not be inherited.
- 4- The first recombinant DNA molecule was created by combining DNA from the simian virus SV40 with that of the lambda virus.
- 5- Ice-minus *Pseudomonas syringae* is the first GMO to be released into the environment.
- 6- *Mycoplasma laboratorium* is the first organism created by using a synthetic genome.
- 7- Nanoparticles are more subject to the Brownian motion and usually do not sediment.
- 8- Nanoparticles are often coated with other substances, similar to either the particle's material or the surrounding medium.
- 9- After transfer to the target cell, DNA construct must be stably integrated into the genome.
- 10- Transformation is the single process that leads to horizontal gene transfer.

(B) Complete the following with suitable words:

**DO NOT copy the sentences to your answer sheet**

- After approval by FDA, \_\_\_\_ (1) \_\_\_\_ was considered as the first genetically modified food from animals.
- \_\_\_\_ (2) \_\_\_\_ is a physical transfection method that works by passing thousands of volts across suspended cells in a cuvette.
- \_\_\_\_ (3) \_\_\_\_ is a series of widely used non-liposomal transfection reagents capable of directly transfecting a wide variety of cells with high efficiency and low toxicity.
- \_\_\_\_ (4) \_\_\_\_ refers the process of injecting foreign DNA by a virus into the host cell.
- Blue-white screening relies on the principle of \_\_\_\_ (5) \_\_\_\_, where a fragment of the *lacZ* gene in the plasmid can complement another mutant *lacZ* gene in the cell.
- \_\_\_\_ (6) \_\_\_\_ is a technique in which nanofibers, nanotubes, and nanowires are used to introduce nucleic acids into cells.
- Magnetofection is a technique in which nucleic acids are attached to \_\_\_\_ (7) \_\_\_\_ particles and driven into the target cells by magnets.
- The 3-D architecture of dendrimers may be distinguished into \_\_\_\_ (8) \_\_\_\_, \_\_\_\_ (9) \_\_\_\_, and \_\_\_\_ (10) \_\_\_\_ outer surface.

**QUESTION (2):**

(25 Marks)

Write on the following:

- 1- Sonoporation
- 2- Microinjection
- 3- Lipofection
- 4- Lentiviruses

(4 marks)  
 (5 marks)  
 (8 marks)  
 (8 marks)

**QUESTION (3):**

(20 Marks)  
(12 marks)

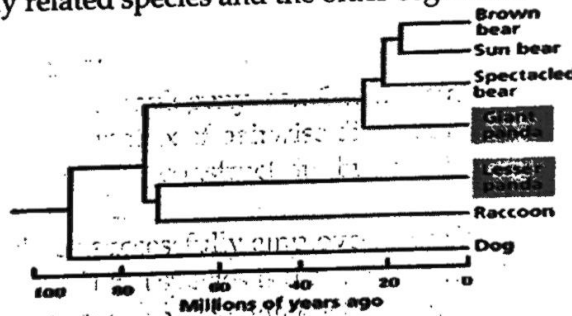
**A: Complete the following:**

- Distance matrices are used in phylogeny as...1.....distance methods and were originally applied to ...2..... data using a matrix of pairwise distances.
- There are several methods for tree construction, but most of them can be classified as either ...3..... or ...4.....
- The first molecular methods successfully employed were based on the analysis of ...5.....
- The distinctive RFLP profile of each species is the result of .....6.....
- .....7.....a single specimen chosen as the nomenclature type.
- The typical animal mtDNA has a high ...8..... rate and .....9.....
- .....10.....is a continuous line of descent; a series of organisms or genes connected by ancestor/ descendent relationships.
- In phylogenetics, maximum parsimony is an .....11.....under which the phylogenetic tree that .....12..... the total number of character-state changes.

(8 marks)

**B: -From the phylogenetic tree answer the following:**

- Which organism has the greatest genetic difference from the Spectacled Bear?
- Mention the number of clades.
- Mention the most closely related species and the older organism.



**QUESTION (4):**

(25 Marks)

**A-Three major characteristic of the DNA molecule** makes it an extremely useful tool for molecular species identification. (Discuss). (15 marks)

**B-Draw a phylogenetic tree based on the data below. Draw hatch marks on the tree to indicate the origin(s) of each of the 6 characters. (10Marks)**

Character	Lancelet (outgroup)	Lamprey	Tuna	Salmonider	Turtle	Leopard	Dolphin
Backbone	0	1	1	1	1	1	1
Hinged jaw	0	0	1	1	1	1	1
Four limbs	0	0	0	1	1	1	1
Amnion	0	0	0	0	1	1	1
Milk	0	0	0	0	0	1	1
Dorsal fin	0	0	1	0	0	0	1

\*Although adult dolphins have only two obvious limbs (their flippers), as embryos they have two hind-limb buds, for a total of four limbs.

Best Wishes

Prof. Ahmed M. Ghoneim

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