Høgskolen i Telemark

Fakultet for allmennvitenskapelige fag

EKSAMEN

Molecular Genetics 4326

27.10.2015

Time: 4 hours

Language: English

No of pages: 4

Aids: None

Remarks: Answer all the questions. Question 1-3 have equal weight. You may answer in English or in Norwegian

Attachment: Genetic code

The result will be on StudentWeb.

English

Question 1.

a) What is the function of the Shine-Dalgarno consensus sequence?

b) How are tRNAs linked to their corresponding amino acids?

c) Which components are required for replication in bacteria, and what are their function (fill in a table as described below)?

Number	3 a) Component	3 b) Function
1	Initiator protein	Binds to origin and separates strands of DNA to initiate replication.
2		
3		
4		
5		
6		
7		
8		

Question 2.

a) Before DNA was identified as the genetic material, biologist agreed that the genetic material must possess four important characteristics. Briefly describe these four characteristics.

b) Describe the mutation (type of gene mutation) found in the second DNA strand. Write the mRNA strand and explain possible phenotypic effects of the mutation (only the template strand that is used for transcription is written).

-1. 3`-GTG TCG TGC ATG-5`

-2. 3`-GTG TAG TGC ATG-5`

c) Briefly describe three general mechanisms of DNA repair?

Question 3.

a) In cats, fur color is governed by a gene on the X chromosome. There are two alleles, Black, which gives black fur and is dominant, and ginger, which gives orange fur and is recessive.

Explain the following facts:

- Ginger males are much more common than ginger females.
- Some cats show patches of ginger and black fur (tortoiseshell). These are (almost) always females

b) In basilisks, three behavioral characteristics, Aggressive (A), Bloody-minded (B) and Destructive (D) are linked on chromosome 2.

(I) An aggressive, bloody-minded destructive basilisk was mated with a non-aggressive, non-bloody minded, non-destructive basilisk. All the progeny were aggressive, bloody-minded and destructive.
(II) These progeny were mated with non-aggressive, non-bloody-minded, non-destructive basilisks and the progeny's behavior was assessed. The following results were obtained.

Aggressive, bloody-minded, destructive	37
non-aggressive, non-bloody-minded, non-destructive	40
Agressive, non-bloody-minded, non-destructive	15
non-aggressive, **bloody-minded, destructive**	16
Agressive, non-bloody-minded, **destructive**	21
non-aggressive, **bloody-minded**, non-destructive	23
Aggressive, bloody-minded, non-destructive	3
non-aggressive, non-bloody-minded, **destructive**	4
Total progeny	159

What is the order of the genes on the chromosome? What are the dominant and recessive characteristics? What was the genotype of the parents in (I) and the progeny in (II)?

Attachment: Genetic code