Høgskolen i Sørøst-Norge

Eksamen

4328/9002 Applied Genetics

21.2. 2017

Time: 4 hours

Language: English

Pages: 3

Aids: Digital exam

Notes: Part A and part B count 50 % each

Attachments: none

The examination results will be made available at StudentWeb

ENGLISH

Part A

1. What kind of genetic markers are used for identification purposes and why?

2. How does DNA extraction by silica membrane work?

3. How can you test the DNA for fragmentation, and how do you interpret the results?

4. What are the advantages of real-time PCR over conventional PCR?

5. What is the similarities and differences between PCR and chain terminator sequencing (Sanger sequencing) reactions?

6. Name the key components in DNA extraction and explain their action?

7. What is reverse transcriptase?

8. How can you calculate the melting temperature (Tm) of a primer?

9. Exosomes are small membrane vesicles that can be excreted from various cells. What kind of cargo can they have?

10. Explain how gel electrophoresis can be used to separate PCR products?

Part B

Question 1

You are working at a genetic laboratory and a customer has following questions for you:

The customer has a rat problem in her house. She has killed several of them but they keep coming back. She would like to know if the rats are from one family, and then she would assume they live in the house, or if they are unrelated and presumably come from outside the house. The customer would like to know how to proceed and what kind of analysis you can do?

A. What kind of procedures would you use (from sampling to genetic analysis), and explain the tests you choose.

Rats can be infected by a specific RNA-virus Rat heamorphagio virus (RHV) that can be dangerous to humans. The customer would like you to test the rats for virus.

B. Propose and explain a procedure for virus testing (from sampling to genetic analysis).

Question 2

There is a SNP in the canine gene MUTR1 at position 782. It is a C to A polymorphism. Your job is to make a PCR product with high specificity.

601 atctgaaggt ggaaaaaatg ctgaaatagc atacacaatt gaagaaaggt ttacaggaac
661 aggtttacag ggccttggag attatagagc aaggaattca ctcccttaga acccacttct
721 cttgtcttca ttctttttat tgcaggtagg cttttgccaa aagatcaaag agagcagtct
781 gcatcctagt catatattct tctgatactt atgaccccaa gaggcaagac tgtttcttct
841 cctactctaa attgggagat tgatttggat cagttgttgt gtccagagag aggaggatac
901 tatgctttgt ctggtttgga gctcatacca gtcccagtgg ccaggagagg ataaggatat
961 accaaagaag aggcaaggaa aatcttgaga ccaaaccatt aatagtcact gtcctctcta

A. First suggest two PCR primers (forward and reverse) and write them in 5`- 3` orientation (a primer length of 20 bp is recommended). Determine CG content and estimate Tm. You don't have a software program to test the primers, but if you did, what would you test for?

B. Write up the PCR program (with all the temperatures) that you would use. Write also up all the components that you would need for your PCR.

C. Both RFLP and AD-assay™ can be used for SNP testing. Explain one of the methods.