Exam in Bi3013

EXPERIMENTAL CELL AND MOLECULAR BIOLOGY

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Examination date: 19th May, 2014
Examination time (from-to): 09.00 – 13.00 (4 hours)
Permitted examination support material: None

Other information: Language: English
Number of pages: 3 (including front page)
Number of pages enclosed: 0

Checked by:

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Date Signature
NOTICE THAT QUESTIONS 1, 2, 3, AND 4 ARE WEIGHTED EQUALLY, BUT SINGLE QUESTIONS MIGHT BE WEIGHTED DIFFERENTLY (INDICATED IN %). IF NO WEIGHTING IS GIVEN THE SUB-QUESTIONS ARE WEIGHTED EQUALLY. PLEASE START ANSWERING EACH QUESTION (1, 2, 3, and 4) ON A NEW SHEET OF PAPER.

Question 1

In your lab exercises you learnt how to isolate RNA and quantify gene expression by quantitative RT-PCR (qPCR). Based on the knowledge you gained during these exercises, answer following questions.

(a) Name different methods that you can use to check integrity of RNA and describe any one of them (30 %)
(b) What are the important points for RNA isolation and handling? (15 %)
(c) Describe the different steps of column based RNA isolation (20 %)
(d) Use a workflow chart to describe the different steps of a qPCR analysis (20 %)
(e) Briefly compare semi-quantitative PCR and Real-time PCR (qPCR) (15 %)

Question 2

Mass spectrometry (MS) is the most common method used for the detection of analytes in proteomic and metabolomics research and has become an indispensable platform in biology, biotechnology and medicine.

(a) How can you identify proteins from a 2D gel by mass spectrometry? (30 %)
(b) What are the advantages of MALDI TOF MS? (20 %)
(c) Describe briefly the second generation proteomics LC-MS/MS technique. (25 %)
(d) Explain why derivatization of analytes in GC-MS metabolomics analyses often is necessary. (25 %)

Question 3

High throughput sequencing (HTS) technologies have an array of applications for both genome and transcriptome studies.

(a) List some important applications of the HTS technology
(b) What are the advantages / disadvantages with the HTS technology compared to DNA microarray technology?
(c) Explain the principle behind sequencing by synthesis which is used by the Illumina platform.
Question 4

Explain or describe 4 of the 5 following terminologies/techniques, use figures wherever necessary (not more than 200 words for each).

(a) Capillary electrophoresis
(b) The shielding/chemical shift concept of Nuclear Magnetic Spectroscopy (NMR)
(c) Allyl isothiocyanate (Allyl ITC).
(d) Schematic diagram of the light path in brightfield microscopy.
(e) Köhlers illumination principle.