FACULTY OF SCIENCE
DEPARTMENT OF BOTANY AND PLANT BIOTECHNOLOGY

MODULE: BOT3A10
PLANT BIOTECHNOLOGY

CAMPUS APK	**EXAM**	**JUNE 2014**

DATE: 14/06/2014   **SESSION:** 8:30 – 11:30

ASSESSOR: DR E VENTER   **EXTERNAL MODERATOR:** DR B CRAMPTON

DURATION: 3 HOURS   **MARKS:** 100

NUMBER OF PAGES: 2 PAGES   **INSTRUCTIONS:** ANSWER ALL THE QUESTIONS

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QUESTION 1   **(28)**

1.1   Which processes and sequences determine the lifespan of an mRNA molecule? (9)

1.2   What are the implications of plant gene expression on plant transformation?   (13)

1.3   What gene structure has the following border sequences AAGGTAAGT and GCAGGT? How would these structures impact on the expression of a plant gene in *E. coli* if you want to produce a novel compound *in vitro*?   (4)

1.4   What is the difference between a polysome and a nucleosome?   (2)

QUESTION 2   **(38)**

2.1   You are studying wheat in your research group. You are in search of the wheat version (homologue) of a kinase encoding gene that was initially identified from the model plant *Arabidopsis*. The gene is usually expressed under low temperature (cold) conditions. Discuss the creation and use of a specific library that you could use to isolate the wheat gene with reference to the specific questions below.

      2.1.1   After extraction of a specific nucleic acid from wheat you would need to synthesise   a new double stranded nucleic acid copy so that you can clone it into a plasmid to   create your library. How would you perform this synthesis? (12)

      2.1.2   Once you have created a library you would need to screen it for the wheat kinase gene of interest. Discuss the type of probe that you would use and indicate how

this probe will affect the experimental conditions that you use to screen the library. (6)

2.2 You have two populations of wheat plants: one has a novel gene for resistance to disease and the other doesn't. You are interested in isolating and characterizing the novel gene from the resistant wheat population. Which technique will you use to compare the genomes of these two populations at the DNA level to each other and how do you perform this technique? (10)

2.5 How does sequencing by hybridisation (SoLiD) work? (10)

QUESTION 3 (34)

3.1 Name the applications of somaclonal variation to produce plants with useful traits that can be used in breeding programmes. (11)

3.2 Discuss the different types of freezing procedures developed to regulate the types of crystal water that forms inside the frozen plant cells. (17)

3.3 Indicate the possible sources of contamination during plant tissue culture. (6)