國立嘉義大學九十六學年度

生化科技學系碩士班招生考試試題

科目：專業英文

1. What enzyme (A, B, C…or L) is needed for the each of the following techniques ? (2 points each, 20 points total)

(1) ____ labeling by nick translation
(2) ____ addition of 5’ phosphate groups
(3) ____ addition of homopolymer tails to blunt-ended DNA
(4) ____ extension of DNA and addition of extra A at 3’ ends
(5) ____ removal of nucleotides from both strands
(6) ____ cutting single stranded DNA, including “nicks“
(7) ____ removal of nucleotides from 3’ ends
(8) ____ didexoy chain-termination sequencing
(9) ____ repair of a nick (a missing phosphodiester bond)
(10) ____ prevention of recircularization of vector plasmid (no inserts)

A. DNA polymerase I
B. terminal transferase
C. alkaline phosphatase
D. ligase
E. Taq polymerase
F. Klenow enzyme
G. restriction endonuclease
H. S1 nuclease
I. polynucleotide kinase
J. Exonuclease III
K. DNase I
L. Bal 31

2. Please read the following text and answer the question of (1) ~ (4). (20 points)

Water returns from tissue fluid to blood capillaries because the protein concentration of blood plasma is higher than the protein concentration of tissue fluid. Plasma proteins, in contrast to other plasma solutes, cannot pass from the capillaries into the tissue fluid. Therefore, plasma proteins are osmotically active. If a person has an abnormally low concentration of plasma proteins, excessive accumulation of fluid in the tissues—a condition call edema— will result. This may occur, for example, when a damaged liver (as in cirrhosis) is unable to produce sufficient amounts of albumin, the major protein in the blood plasma.

(1) Please translate the sentence of “Water returns from tissue fluid to blood capillaries because the protein concentration of blood plasma is higher than the protein concentration of tissue fluid” into Chinese. (7 points)
(2) Please translate the sentence of “This may occur, for example, when a damaged liver is unable to produce sufficient amounts of albumin, the major protein in the blood plasma” into Chinese. (7 points)
(3) Which will make edema happen in tissue? (a) high concentration of plasma proteins in blood plasma, (b) less water in tissue, (c) less protein concentration in tissue fluid, (d) low concentration of plasma proteins in blood plasma. (3 points)
(4) If organ can not produce sufficient amounts of albumin, then, it will cause edema in tissues. Which organ is responsible for producing albumin? (a) stomach, (b) liver, (c) kidney, (d) heart. (3 points)

3. Please read the following text and answer the question of (1) ~ (4) in Chinese. (20 points)

(1) The advantages of using plants as an alternative for production of recombinant protiens.
(2) The potential of plants in pharmaceutical industries.
(3) What are the approaches in production of recombinant protiens in plants?
(4) Is it possible for an edible vaccine confer protection in plant tissue ?

Approaches to achieve high-level heterologous protein production in plants.
(Streatfield, Stephen J. Plant Biotechnology Journal; Jan2007, Vol. 5 Issue 1, p2-15.)

Abstract:

Plants offer an alternative to microbial fermentation and animal cell cultures for the production of recombinant proteins. For protein pharmaceuticals, plant systems are inherently safer than native and even recombinant animal sources. In addition, post-translational modifications, such as glycosylation, which cannot be achieved with bacterial fermentation, can be accomplished using plants. The main advantage foreseen for plant systems is reduced production costs. Plants should have a particular advantage for proteins produced in bulk, such as industrial enzymes, for which product pricing is low. In addition, edible plant tissues are well suited to the expression of vaccine antigens and pharmaceuticals for oral delivery. Three approaches have been followed to express recombinant proteins in plants: expression from the plant nuclear genome; expression from the plastid genome; and expression from plant tissues carrying

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recombinant plant viral sequences. The most important factor in moving plant-produced heterologous proteins from developmental research to commercial products is to ensure competitive production costs, and the best way to achieve this is to boost expression. Thus, considerable research effort has been made to increase the amount of recombinant protein produced in plants. This research includes molecular technologies to increase replication, to boost transcription, to direct transcription in tissues suited for protein accumulation, to stabilize transcripts, to optimize translation, to target proteins to subcellular locations optimal for their accumulation, and to engineer proteins to stabilize them. Other methods include plant breeding to increase transgene copy number and to utilize germplasm suited to protein accumulation. Large-scale commercialization of plant-produced recombinant proteins will require a combination of these technologies.

In addition, for protein products that are not extracted and purified prior to use, expression must be sufficiently high to ensure efficacy. For example, for an edible vaccine, a sufficient dose of antigen to confer protection must be delivered in a quantity of plant tissue that can be practically ingested at a single sitting.

4. After reading the following abstract, please describe briefly how *Sox9* (a transcription factor) maintains pancreatic progenitors. (20 points)

The factors necessary to maintain organ-specific progenitor cells are poorly understood and yet of extreme clinical importance. Here, we identify the transcription factor SOX9 as the first specific marker and maintenance factor of multipotential progenitors during pancreas organogenesis. In the developing pancreas, SOX9 expression is restricted to a mitotically active, Notch-responsive subset of $PDX1^{+}$ pluripotent progenitors and is absent from committed endocrine precursors or differentiated cells. Similar to Notch mutations, organ-specific *Sox9* inactivation in mice causes severe pancreatic hypoplasia resulting from depletion of the progenitor cell pool. We show that *Sox9* maintains pancreatic progenitors by stimulating their proliferation, survival, and persistence in an undifferentiated state. Our finding that SOX9 regulates the Notch-effector HES1 suggests a Notch-dependent mechanism and establishes a possible genetic link between SOX factors and Notch. These findings will be of major significance for the development of *in vitro* protocols for cell replacement therapies (*Seymour PA et al., PNAS, 104: 1865-1870, 2007*).

5. Translation from English to Chinese. (20 points)

As a plant microcomponent, resveratrol is a polyphenolic compound produced by several species and found especially in *Polygonum* roots, peanuts seeds, berries and also grape and therefore can be present in human diet or beverages (red wine, for instance). Traditional Chinese medicine and more recent epidemiological studies strongly suggested that resveratrol may act as a cancer chemopreventive compound. The biochemical mechanism by which resveratrol inhibits cell proliferation was provided by studies in numerous human cell lines including our work in hepatoblastoma HepG2 and colorectal tumor SW480 cells. The results show that resveratrol strongly inhibits cell proliferation at the micromolar range in a time- and dose-dependent manner. Resveratrol appears to block the cell cycle at the transition S to G2/M since there is no inhibition of [^{3}H]-thymidine incorporation observed, while there is an increase of the cell number in S phase. On the other hand, in order to evaluate if the amount of resveratrol taken up during food or drink consumption is sufficient to ensure in the whole body the *in vitro* described beneficial effects, we evaluated the ratio between plasmatic level of resveratrol and its cell bioabsorption. Our study reports a higher uptake of resveratrol in the human hepatic derived HepG2 cells than in colorectal derived SW480 cells. In contrast, resveratrol is conjugated in these cells and derivatives are released in large amounts in the cell medium. Based on present knowledge, resveratrol appears to be a promising bioactive natural molecule with potential applications in phytotherapy, pharmacology or in nutriprotection (nutraceutic food) area.