國立成功大學
111學年度碩士班招生考試試題

編　號：271

系　所：藥理學研究所

科　目：生物化學

日　期：0220

節　次：第 3 節

備　註：不可使用計算機

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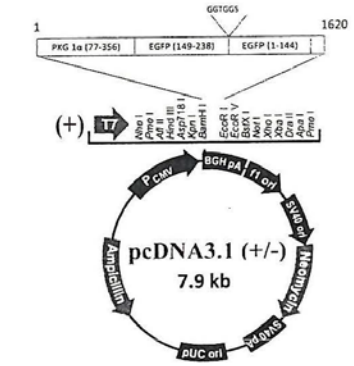
考試日期：0220，節次：3

※ 考生請注意：本試題不可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. The functional domain of X protein is shown as: ---ANDGHSVCARGH---, please answer the following questions: (total 15 %)
   a. Which amino acid could be phosphorylated to regulate the protein activity? (3 %)
   b. X protein can be glycosylated on which amino acid? (3 %)
   c. In order to mimic the activation or kinase-dead protein, what kind of amino acids could be as the phospho- and dephospho-mimetic substitutions? (3 %)
   d. What kind of amino acid confer the sulfhydryl group to the folding of polypeptide chains? (3 %)
   e. If X protein is secreted and released into serum, what's tools can be used to detect it? (3 %)

Alanine	Ala	A
Arginine	Arg	R
Asparagine	Asn	N
Aspartic acid	Asp	D
Cysteine	Cys	C
Glutamic acid	Glu	E
Glutamine	Gln	Q
Glycine	Gly	G
Histidine	His	H
Isoleucine	Ile	I
Leucine	Leu	L
Lysine	Lys	K
Methionine	Met	M
Phenylalanine	Phe	F
Proline	Pro	P
Serine	Ser	S
Threonine	Thr	T
Tryptophan	Trp	W
Tyrosine	Tyr	Y
Valine	Val	V

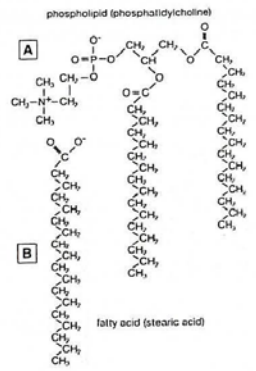
2. The promoter region of the Y gene has the sequence shown as follows: ---ATTCGCCGCGTTGGTAAA---, please answer the following questions: (total 20 %)
   a. If Y gene is turned off in normal condition, please explain the possible mechanism involved in the regulation of gene silencing; and what kind of tools (assays) could be used to evaluate the percentage (potency) of gene silencing? and what is the principle of the assay? (12 %)
   b. If you want to construct Y gene into the expression vector such as pcDNA3.1, what antibiotic could be used to select the clone? (2 %)
   c. How to verify the selected clone with the correct orientation of inserted gene? (2 %)
   d. If the gene is cloned with Hind III and EcoR V sites, how to label and analyze the inserted gene that has the correct size? (4 %)



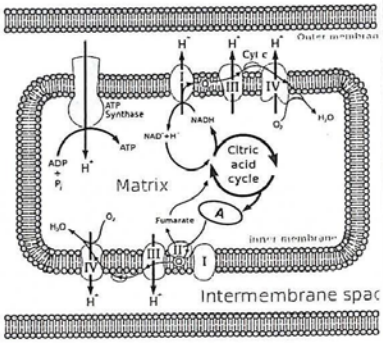
pRSET-C vector alone: 5.4 kb
δ-FlincG insert: 2.5 kb

3. The phospholipids are the major class of membrane lipids, please answer the following questions: (total 23 %)

a. What parts (A and B) are the hydrophobic and hydrophilic properties? (3 %)
b. In addition to temperature, what substance can determine membrane fluidity? (3 %)
c. Please describe the principle of micelle formation. (3 %)
d. Please describe the differences between palmitate and oleate. (4 %)
e. Why the low-density lipoprotein (LDL) is associated with atherosclerosis? (5 %)
f. Please define the functions of membrane receptors and nuclear receptors in cells. (5 %)



4. The proliferation and survival of cells are relied on supporting the production of energy through aerobic and anaerobic metabolism. Please answer the following questions: (total 27 %)
a. What organelle can produce ATP in cells? (3 %)
b. How much ATP can be produced during aerobic and anaerobic respiration? (3 %)
c. What is substrate A for the processing of oxidative phosphorylation shown in the figure? (3 %)
d. Please describe the process (steps) in the production of reactive oxygen species (ROS) and ATP during oxidative phosphorylation. (6 %)
e. What is the source (metabolic substrate) for the formation of Acetyl-CoA (3 %)
f. What is the major electron donor in reductive biosynthesis? (3 %)
g. What substrates are essential for the synthesis of citrate in the citric acid cycle? (3 %)
h. What is the major product of anaerobic metabolism, which confers the lower pH value in the extracellular environment? (3 %)



5. Please descript the following terms: (15 %)
a. Endocytosis
b. CRISPR-Cas9
c. Exosome
d. Metabolomics
e. Ferroptosis