※ 考生請注意：本試題 □可 ■不可 使用計算機

1. Please answer the following questions considering the properties of amino acids and protein. (14%)

   a. What is the absorbance wavelength most commonly used for determining protein concentration?

   b. Considering the amino acid composition of two proteins A and B listed in the table below (both are proteins of monomer):

      i. Which one is expected to have higher molar extinction coefficient at the wavelength you indicated above? Please provide the rationale for your answer.

      ii. Which one is more likely to have molecular weight ranging between 40 kD and 60 kD? Please provide the rationale for your answer.

      iii. Please suggest and briefly describe two experiments to confirm your answer in the question above (ii) for determining the molecular weight of these proteins?
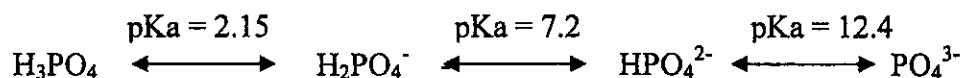
Amino acid	A	C	D	E	F	G	H	I	K	L	M	N	P	Q	R	S	T	V	W	Y
Protein A	31	14	20	32	37	41	15	22	36	28	12	24	23	14	23	27	26	28	9	19
Protein B	73	15	49	70	27	76	19	68	74	70	32	40	39	34	32	46	43	63	3	20

2. Considering <u>gene knockdown</u> (10%):

   (1) What are the advantages and disadvantages of this technology in comparison to <u>gene knockout</u>?

   (2) What are the strategies commonly employed to accomplish gene knockdown currently? (Please describe two strategies at least.)

3. What are the approximate concentration of $H_2PO_4^-$ in 1 M phosphate solution at pH values of 2, 6, and 10? (6%)

   Note that:

$$H_3PO_4 \xleftrightarrow{\text{pKa} = 2.15} H_2PO_4^- \xleftrightarrow{\text{pKa} = 7.2} HPO_4^{2-} \xleftrightarrow{\text{pKa} = 12.4} PO_4^{3-}$$

（背面仍有題目，請繼續作答）

※ 考生請注意：本試題 □可 ■不可 使用計算機

4.　Cells and tissues in all organisms regulate gene expression and turnover of gene transcripts, and a spectrum of gene expression levels might determine the physiological or pathophysiological status. Please describe one method, including it's <u>principle (6%)</u>, and <u>sample preparation (6%)</u>, which can be applied to the detection and quantification of mRNA copy number in your target cell or tissue samples.

5.　Searching accurate biomarkers in prediction or diagnosis of disease is demanded increasingly. Please read the following abstract, taken from Journal of Cardiology (2008) 52(2):118-26, and answer the questions a-c.

BACKGROUND: Worldwide coronary heart disease (CHD) is estimated to be the leading cause of death. Current knowledge about prevention of CHD is mainly derived from developed countries. Therefore, this study aimed to find out the association of CHD with ratios of different lipoproteins and apolipoproteins, LDL particle size, as well as different traditional risk factors in Asian Indian population in Eastern part of India. METHODS: Case-control study of 100 patients with CHD and 98 healthy controls were age and sex matched. After clinical evaluation, blood samples were collected for biochemical assays. RESULTS: Multivariate logistic regression analysis found apoB (OR 2.96; 95% CI 1.02-8.54), apoB/HDL-c (OR 4.14; 95% CI 1.33-12.83), nonHDL-c (OR 5.41; 95% CI 2.08-14.10), apoB/apoAI (OR 6.64; 95% CI 2.37-18.57), and LDL particle size (9.59; 95% CI 2.92-31.54) were independently associated with CHD. CONCLUSIONS: Findings from the multivariate analysis, apoB, apoB/HDL-c, nonHDL-c, apoB/apoAI, and LDL particle size are potent indicators and useful for diagnosis of predisposed CHD.

a)　What is a <u>case-control study</u> ? (6%)

b)　What is <u>odd ratio</u> (OR) ? How to interpret the value of OR ? (6%)

c)　According to the abstract, please give a <u>TITLE</u> in either Chinese or English for this manuscript (less than 20 words). (6%)

系所組別： 醫學檢驗生物技術學系
考試科目： 生物技術　　　　　　　　　　　　　　　考試日期：0308，節次：2

※ 考生請注意：本試題 □可 ■不可 使用計算機

6. Bioimaging is one of the powerful tools for visualizing molecules in cells, tissues, organs, even in whole animals. Please give two techniques for single-cell imaging, two techniques for whole animal visualization, and two techniques (or instruments) for clinical diagnosis. (18%)

7. If you have isolated a protein X which participated in the signal transduction pathway of cell proliferation in cancer cell. Please clearly describe the procedures for producing monoclonal antibody for protein X by hybridoma technology. (10%)

8. Please briefly describe the using of nanotechnology in genomics (6%) and proteomics. (6%)