

Biological Chemistry I

I Answer the following questions.

- (1) Explain what plasmid is.
- (2) Explain the mechanism amplifying DNA with the polymerase chain reaction (PCR).
- (3) Explain the mechanism separating DNA with gel electrophoresis.
- (4) Most proteins absorb light at 280 nm. Explain the relation among the absorbance ( $A$ ) of protein solution, molar concentration ( $M$ ), molecular extinction coefficient ( $\epsilon$ ) at 280 nm, and optical path length ( $d$ ).
- (5) The green fluorescent protein (GFP) absorbs visible light and emits fluorescence. Explain the reason why the wavelength of fluorescence is generally longer than that of absorbed light.

## Biological Chemistry II

II— a

Give an example of analytical method to determine three-dimensional structures of biomacromolecules at atomic resolution based on each of the following physical phenomena, and outline them with mentioning their possible advantage(s) and drawback(s).

- ( 1 ) Diffraction of electromagnetic wave
- ( 2 ) Magnetic dipole-dipole interaction

II— b

Explain the following phenomena regarding protein structure formation in terms of entropic changes in the systems.

- ( 1 ) A hydrophobic core is formed in the interior of a globular protein.
- ( 2 ) Stability of protein structures can be increased by disulfide bond formation.