<Syllabus of Science>

[Purpose of the Examination]
The purpose of this examination is to test whether international students have the basic academic ability in science necessary for studying at universities or other such higher educational institutions in Japan.

[Classification of Examination]
The examination consists of three subjects, i.e. physics, chemistry, and biology; examinees will select two of these subjects.

[Scope of Questions]
The scope of questions is as follows. What is taught in elementary and junior high schools is regarded to have been already learned and therefore is to be included in the scope of the EJU. What questions consists of in each subject is classified into categories, each of which is presented by topics and scientific terms.

Biology
The scope of questions will follow the scope of “Basic Biology” and “Advanced Biology” of the Course of Study for high schools in Japan.

I Biological Phenomena and Substances
1. Cells and molecules
   (1) Biological substances and cells
      Organelle
      Prokaryotic and eukaryotic cells
      Cytoskeleton
   (2) Biological phenomena and proteins
      Protein structure
      Protein function  [Example] enzyme
2. Metabolism
   (1) Life activities and energy
      ATP and its role
   (2) Respiration  [Example] glycolytic pathway, citric acid cycle, electron transport system, fermentation and glycolysis
   (3) Photosynthesis  [Example] photosystem I, photosystem II, Calvin-Benson cycle, electron transport system
   (4) Bacterial photosynthesis and chemosynthesis
   (5) Nitrogen assimilation
3. Genetic information and its expression
(1) Genetic information and DNA
   Double-helix structure of DNA
   Gene, chromosome and genome
(2) Segregation of genetic information
   Segregation of genetic information by somatic cell division
   Cell cycle and DNA replication
   Mechanism of DNA replication
(3) Expression of genetic information
   Mechanism of gene expression  [Example] transcription, translation, splicing,
   Changes in genetic information  [Example] gene mutation
(4) Control of gene expression
   Regulation of transcriptional level
   Selective gene expression
   Cell differentiation by gene expression control
(5) Biotechnology  [Example] genetic transformation, gene transfer

II  Reproduction and Generation
1.  Sexual reproduction
   (1) Meiosis and fertilization
      Gene segregation by meiosis
      Genetically diverse combination by fertilization
      Sex chromosomes
   (2) Genes and chromosomes
      Genetic linkage and gene recombination
      Chromosomal crossing-over and gene recombination
2.  Animal development
   (1) Animal gametogenesis and fertilization
   (2) Early developmental process in animals
   (3) Cell differentiation and morphogenesis in animals
3.  Plant development
   (1) Plant gametogenesis, fertilization and embryogenesis
   (2) Organ differentiation in plants  [Example] floral morphogenesis

III  Homeostasis of the internal environment in living organisms
1.  The internal environment in living organisms
   (1) Fluid movement in the circulatory system
   (2) The composition of body fluid and its concentration control
   (3) Mechanism of blood coagulation
2.  Homeostatic mechanism of the internal environment in living organisms
   (1) Internal regulation by autonomic nerves and hormones  [Example] control of blood glucose level
3. Immunity
   (1) Cells in immune system
   (2) Mechanism of immune system

IV Organisms’ response to external signals
1. Reactions and actions of animals to external signals
   (1) Perception and response to stimulus
      Sensory receptors and their functions
      Effectors and their functions
      Nervous systems and their functions
   (2) Animal behavior
2. Plant responses to external signals
   (1) Functions of plant hormones [Example] functions of auxins, functions of gibberellins
   (2) Functions of plant photoreceptors [Example] functions of phytochrome

V Ecology and Environment
1. Populations and communities
   (1) Populations
      Populations and their structures
      Interaction within populations
      Interaction among populations
   (2) Communities
      Communities and their structures
2. Ecosystems
   (1) Matter production and cycle of matter in ecosystems
      [Example] food web and trophic level, carbon cycle and flow of energy, nitrogen cycle
   (2) Ecosystems and biodiversity
      Genetic diversity
      Species diversity
      Diversity of ecosystems
      Ecological balance and conservation
   (3) Diversity and distribution of vegetation [Example: succession of vegetation]
   (4) Climates and biomes

VI Biological Evolution and Phylogeny
1. Mechanism of biological evolution
   (1) Origin of life and transition of organisms
      Beginning of life
      Evolution of organisms
      Human evolution
(2) Mechanism of evolution
   Variation between individuals (mutation)
   Changes in gene frequency and its mechanism
   Molecular evolution and neutral evolution
   Species differentiation
   Coevolution

2. Phylogeny of organisms
   (1) Phylogenetic classification of organisms  [Example] Comparison of DNA base sequence
   (2) Higher taxa and phylogeny