

## Syllabus for EJU Subject Examinations (Basic Scholastic Ability)

### < Science > ( with relation to MEXT\* curriculum guidelines )

\*Ministry of Education, Culture, Sports, Science and Technology

#### Purpose of the Examination

The purpose of this examination is to test whether students from other countries have the basic scholastic ability in science considered necessary for studying at the undergraduate level at a Japanese university.

The examination consists of physics, chemistry, and biology; examinees select two of these subjects.

The questions are classified according to each of these three subjects; each subject section has questions and a list of relevant terminology.

### **Biology**

#### I Continuity of life . . . **Biology I**

##### 1. Cell

###### (1) Cell function and structure

- Eukaryotic and prokaryotic cells
- Cellular transport and cell membrane permeability
- Cell function and enzyme

###### (2) Cellular multiplication and structure of organism

- Unicellular and multicellular organisms
- Somatic division (mitosis)
- Cell differentiation, tissue and organ

##### 2. Reproduction and embryonic development

###### (1) Reproductive cell formation and fertilization

- Kinds of reproduction
- Gametogenesis and fertilization in animals
- Gametogenesis, fertilization, and embryogenesis in plants

###### (2) Mechanism of animal development

- Development process
- Development mechanism

##### 3. Heredity

###### (1) Law of inheritance

- Mendel's law of inheritance
- Examples of inheritance

###### (2) Gene and chromosome

- Linkage, recombination, and chromosome map
- Sex chromosome and sex determination
- Sex-linked inheritance
- Transformation, bacteriophage infection in host cell
- DNA double helix structure

II Environment and biological response ··· Biology I

1. Environment and animals response

(1) Body fluid and homeostasis

Role and circulation of body fluid

Principle of homeostasis

Autonomic nervous and hormone

Defense of body against infection

(2) Reception of stimulus and response

Acceptor

Nerve and excitation conduction system

Role of central nervous system

Animal behavior

2. Environment and plants response

(1) Plant life and environment

Water absorption and transpiration

Photosynthesis and environment

(2) Response and regulation of plants

Germination

Growth

Flower bud formation

Tropism

III Organism and substance ··· Biology II

1. Protein and its function in organism

(1) Biochemical reaction and enzyme

Metabolism and enzyme

Property of enzyme

(2) Assimilation and dissimilation

Energy metabolism and ATP

Photosynthesis

Nitrogen assimilation

Respiration and microstructure of cell, respiration and enzyme

(3) Protein function

Protein structure and function

Immunity

Muscular contraction

Membrane transport and intercellular communication

2. Genetic information and its expression

(1) Genetic information and protein synthesis

Structure and replication of DNA

Genetic code and protein synthesis

Mechanism of phenotypic expression

Difference in phenotypic expression between prokaryotic and eukaryotic cells

(2) Phenotypic expression and morphogenesis

Control of transcription

Cell differentiation, morphogenesis, and genetic information

(3) Biotechnology

Genetic recombination

Tissue culture, nuclear transplantation, cell fusion, etc.

Application of gene engineering