

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.

Chemistry

Chemical nature of substances ... Chemistry

1 . Inorganic substances

(1) Elements

Nature of typical elements and the periodic table
1st to 3rd period and K, Ca .

(2) Compound

Compounds of typical elements
Compounds of transition elements such as Ag, Cu, Zn, Fe, Ni, Mn, Cr .
Oxide
Hydroxides

(3) Detection of ions

Reactions of typical ions
Colour reactions and precipitation reactions
 Ag^+ , Cu^{2+} , Zn^{2+} , Ba^{2+} , Ca^{2+} , Sr^{2+} , Mg^{2+} , Na^+ , K^+ , Al^{3+} , Pb^{2+} , Fe^{2+} , Fe^{3+} ,
 Cl^- , SO_4^{2-} , HCO_3^- , I^- .

2 . Organic substances

(1) Chemical features of organic compounds

Aliphatic compounds and aromatic compounds
Constituent of organic compounds
Determination of molecular formula
Structures of organic compounds and classification
Structural formula and isomers

(2) Compounds containing carbon, hydrogen, and oxygen

Hydrocarbons, Alcohols, Ethers, Aldehydes, Ketones
Carbonic acids, Phenols
Fats/oils and detergents

(3) Compounds containing nitrogen

Amines, Aromatic nitro compounds, Amino acids

3 . Synthetic polymers

Polyethylene, Polypropylene, Polyacrylonitrile, Poly(vinyl chloride),
Poly(vinyl acetate), Polyesters, Nylon

4 . Reactions of organic compounds

(1) Substitution reactions

(2) Addition reactions

(3) Polymerization reactions

State of substance ...

Chemistry

1 . Pure substance

- (1) Three states of matters
- (2) Melting and evaporation, melting point and boiling point
- (3) Equation of state

2 . Mixture

- (1) Partial pressure of a gas
- (2) Solution
 - Dissolution and solubility
- (3) Nature of dilute solution
 - Elevation of boiling point
 - Depression of freezing point
 - Osmotic pressure
- (4) Colloidal solution
 - Nature of colloidal solution

Chemical reaction ...

1 . 3 : Chemistry	, 2 . 4 . 5 : Chemistry
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1 . Rate of reaction (qualitative treatment only)

- (1) Fast reaction and slow reaction
 - (including catalysts)

2 . Chemical reaction and heat of reaction

- (1) Heat of reaction
- (2) Thermochemical equation

3 . Chemical equilibrium

- (1) Reversible reaction
- (2) Shift of chemical equilibrium

4 . Acid base reaction

- (1) Acid and base
- (2) Neutralization
- (3) Hydrogen ion concentration, pH

5 . Redox reaction

- (1) Oxidation and reduction
- (2) Electrolysis
- (3) Ionization tendency
- (4) Electric cell (battery)

Structure of matter ...

2 (3) : Chemistry	, others : Chemistry
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1 . Atomic structure

- (1) Models of atomic structure
- (2) Shell structure of electrons
- (3) Structure of atoms and the periodic table

2 . Chemical bond

- (1) Ionic bond
- (2) Covalent bond
- (3) Structure of matter and nature of matter