

# Ya-Sa-Shi-I Biological Science

やさしい基礎生物学 English version



## CONTENTS

### Preface

日本語版（第2版）の序

## Part 1. Structure and functions of life

### Chapter 1 Structure of the cell and the origin of life... 12

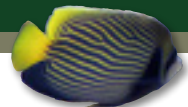
- 1.1 The smallest unit of life: the structure and function of cells ..... 12
- 1.2 Origin and diversification of organisms and the emergence of multicellular organisms ..... 22
- 1.3 Cell adhesion ..... 25
- The issue of chapter end ..... 26

### Chapter 2 The components of life ..... 27

- 2.1 Macromolecules are the building blocks of life ..... 27
- 2.2 Amino acids and protein ..... 28
- 2.3 Glucide (Carbohydrate) ..... 32
- 2.4 Lipids ..... 36
- 2.5 Nucleic acid ..... 39
- 2.6 Vitamins and mineral ..... 41
- The issue of chapter end ..... 42

### Chapter 3 Structure and function of gene ..... 43

- 3.1 Structure of DNA and central dogma ..... 43



<b>3.2</b>	Reproduce DNA for cell division	47
<b>3.3</b>	RNA is synthesized by transcribing a gene	49
<b>3.4</b>	Translate RNA and synthesize protein	53
<b>3.5</b>	In the case of prokaryotic cell	55
	<b>The issue of chapter end</b>	56

## *Chapter 4* **Living organisms and energy** ..... **57**

<b>4.1</b>	An enzyme supports metabolism	57
<b>4.2</b>	ATP supplies energy necessary for metabolism	62
<b>4.3</b>	Glycolysis	64
<b>4.4</b>	Tricarboxylic acid cycle	64
<b>4.5</b>	Electron transport chain	66
<b>4.6</b>	Blood glucose level regulation for producing ATP	68
	<b>The issue of chapter end</b>	69

## *Chapter 5* **Photosynthesis and nitrogen assimilation** ..... **70**

<b>5.1</b>	Photosynthesis is the energy source for all life	70
<b>5.2</b>	Photosynthesis mechanism	74
<b>5.3</b>	Evolution of photosynthesis and plants	78
<b>5.4</b>	Mechanism of nitrogen assimilation	81
	<b>The issue of chapter end</b>	82

## **Part 2. The continuity of life**

### *Chapter 6* **Cell division, signaling and cancerization** .. **84**

<b>6.1</b>	Cell division supporting life	84
<b>6.2</b>	Cell differentiation and information exchange among cells	91
<b>6.3</b>	Collapse of cellular society	93
	<b>The issue of chapter end</b>	96

### *Chapter 7* **Fertilization and growth of life** ..... **97**

<b>7.1</b>	Mechanism of reproduction	97
------------	---------------------------	----

<b>7.2</b>	Early development: Process from fertilization to body formation	— 102
<b>7.3</b>	Apoptosis and individual aging	— 108
	<b>The issue of chapter end</b>	— 112

## Part 3. Response and regulation in organisms

<i>Chapter</i> <b>8</b>	<b>Self-maintenance mechanisms in multicellular organisms</b>	..... 114
<b>8.1</b>	Self-maintenance in organisms	— 114
<b>8.2</b>	The information transmission system among cells	— 115
<b>8.3</b>	Maintenance mechanism of living organisms	— 119
<b>8.4</b>	Biological defense system in organisms	— 130
	<b>The issue of chapter end</b>	— 138

<i>Chapter</i> <b>9</b>	<b>Fundamental principles of heredity and human genetic disorders</b>	..... 139
<b>9.1</b>	The basic principle of heredity	— 139
<b>9.2</b>	Various rules of inheritance	— 147
<b>9.3</b>	Sex and heredity	— 149
<b>9.4</b>	Genetic linkage and independent assortment	— 154
<b>9.5</b>	Human genetic disorders	— 157
	<b>The issue of chapter end</b>	— 162

## Part 4. Organisms and their environment

<i>Chapter</i> <b>10</b>	<b>Ecosystems are composed of organisms and environment</b>	..... 164
<b>10.1</b>	Organisms and environments interact with each other	— 164
<b>10.2</b>	Population growth and decline	— 168
<b>10.3</b>	Circulation of material, and energy flow in ecosystems	— 171
<b>10.4</b>	Environmental issues are familiar	— 174
<b>10.5</b>	Animal behaviors	— 182
	<b>The issue of chapter end</b>	— 185



## Chapter 11 Evolution and the diversity of organisms .. 186

11.1 Histories of the origin and evolution of organisms	186
11.2 Mechanisms and evidence of evolution	192
11.3 Systematic classification of organisms	198
<b>The issue of chapter end</b>	204

## Chapter 12 Life-science technology and society ..... 205

12.1 Clinical research, epidemiological study and bioethics	205
12.2 Ethics of animal testing	206
12.3 Genetically-modified crops	207
12.4 Genetically-modified animals	208
12.5 Technology of animal cloning	209
12.6 Stem cells and regenerative medicine	211
<b>The issue of chapter end</b>	213

**References** ..... 214

**Index** ..... 215

### Column

- Nucleus and Cytoplasm 13
- The Endosymbiotic Theory of Margulis - The Evolution by Eukaryotic Cells in the Symbiosis of Intracellular Organelles 24
- Function of Cholesterol 38
- DNA Damage and Repair 47
- Foot Grows from Head 50
- Genetic Personality and Abnormality 53
- There are Two Meanings to "Breath" 64
- Decision of Angie 95
- Asexual Reproduction vs Sexual Reproduction 97
- Organisms Having more than 100 Kinds of Sexes 100
- The Response to Stimulation 121
- Experimental Success is Determined by the Selection of Experimental Materials 142
- Advocate for the Chromosomal Theory of Inheritance 151
- Adaptation of Animal to an Environmental Condition 164
- Banded Iron Formation and the Stromatolites 188
- Lamarck's Theory of Evolution 194
- Ontogeny Recapitulates Phylogeny 198
- Classification by the Number of Genome 199
- Shiny Protein 209