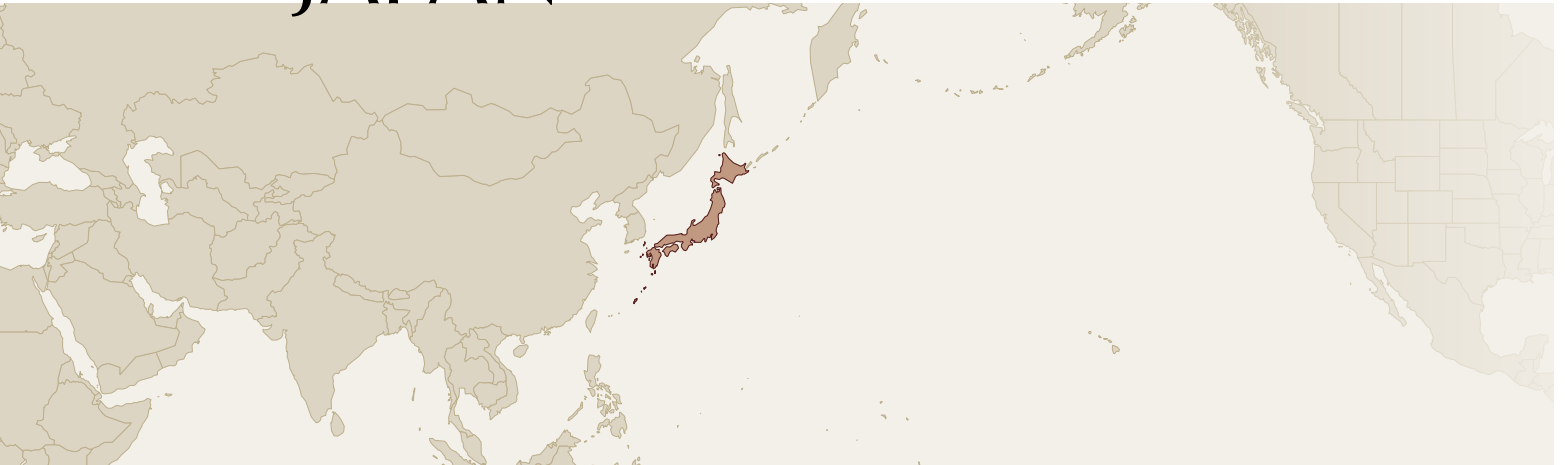


# JAPAN



## PISA Rankings

2006			2003			2000		
MATH	SCIENCE	READING	MATH	SCIENCE	READING	MATH	SCIENCE	READING
10	5	15	6	2	14	2	2	8

Population size:	127,770,794
Student enrollment:	10,823,873 in 2005
U.S. states with similar statistics:	California would be the closest state with 6,437,202 in the 2005-06 school year.

### General description of K–12 education:

Compulsory education includes six years of elementary and three years of lower secondary school. The school year is 243 days long. Japan has a national curriculum. Students who complete lower secondary school can apply to upper secondary schools or colleges of technology. In 2007, national assessments were reintroduced (since 1964). All students are assessed in 6th and 9th grade in the subjects of national language and mathematics.

### Required subjects:

Japanese language, mathematics, social studies, science, moral education, music, art, health and physical education, industrial arts and home economics, foreign languages, geography and history, civics, and integrated studies.

### EXCERPTS

The document included for Japan is an excerpt from the national curriculum that will be initiated in the 2009–10 school year. It was obtained from Satoshi Nara, formerly with the Embassy of Japan in Washington, DC:

- Science—grades 7–9

*Note: This document was translated into English from Japanese.*

# JAPAN

## Excerpts

### NATIONAL CURRICULUM

#### Science • Grades 7–9

### PHYSICS AND CHEMISTRY

#### **1. Familiar Physical Phenomena**

Through observation and experimentation regarding familiar facts and phenomena, to nurture an understanding of the regularity and energetic properties of light and sound, and to foster a scientific perspective and way of thinking, including an understanding of such facts and phenomena in relation to everyday life and society.

##### a. Light and sound

###### (i) Reflection and refraction of light

*To conduct experiments regarding the reflection and refraction of light and to discover the regularity of reflection and refraction of light set at interfaces between different substances such as water and glass.*

###### (ii) Function of convex lenses

*To conduct experiments regarding the function of convex lenses, and to discover the relationship between the position of an object and the position and size of its image.*

###### (iii) Properties of sound

*To conduct experiments regarding sound and to discover that sound is produced by vibrations and transmitted through substances such as air and that the frequency and volume of sound is related to the manner of vibration of the sounding body.*

##### b. Force and pressure

###### (i) Force

*To conduct experiments involving the action of forces on objects, to discover that objects are deformed, begin to move, or move differently when forces act on those objects and to learn that forces are expressed in terms of magnitude and direction.*

###### (ii) Pressure

*To conduct experiments regarding pressure and to discover that pressure is related to the magnitude of a force and the area. In addition, to conduct experiments regarding hydrostatic pressure and atmospheric pressure and to understand the results of such experiments in relation to the weight of water and air.*

#### **2. Familiar Types of Matter**

Through observations and experiments regarding familiar types of matter, to foster an understanding of changes in

the states of matter and the properties of solids, liquids, and gases, and to teach the basics of investigating the properties and changes of matter.

##### a. Properties of matter

###### (i) Familiar types of matter and properties

*To investigate the properties of familiar types of matter by various methods, to discover that substances have both unique and shared characteristics such as their density and how they change when heated, and to learn skills such as how to use experimental apparatus and keep records.*

###### (ii) Production and properties of gases

*To conduct experiments in producing gases and investigating their properties, to discover the characteristics of different types of gases, and to learn skills such as how to produce and collect gases.*

##### b. Aqueous solutions

###### (i) Dissolving substances

*To conduct observations of the solution of substances in water, and to discover that solutes are uniformly dispersed in an aqueous solution.*

###### (ii) Solubility and recrystallization

*To conduct experiments in removing solutes from an aqueous solution, and to understand the relationship between the results of such experiments and the degree of solubility.*

##### c. Changes in state

###### (i) Changes in state and heat

*To conduct observations and experiments in the changes in state of matter, and to discover that mass remains unchanged although the volume of a substance varies with changes in state.*

###### (ii) Melting point and boiling point

*To measure temperatures as substances change to different states, and to discover that substances change in state at their melting points and boiling points and that substances can be separated based on differences in their boiling points.*

#### **3. Electric Currents and their Utilization**

Through observations and experiments regarding electric circuits, to foster an understanding of the relationship between currents and voltage as well as the action of electric currents, and to nurture an elementary perspective and way of thinking about electric currents and magnetic fields in relation to everyday life and society.

## a. Electric currents

## (i) Circuits, currents and voltage

*To conduct experiments to create circuits and measure the current and voltage of circuits, and to discover the regularity of electric current flowing at each point in a circuit and voltage applied to each portion of a circuit.*

## (ii) Currents, voltage, and resistance

*To conduct experiments to measure voltage applied to a metal wire and to measure currents, to discover the relationship between voltage and current, and to discover that metal wires have electrical resistance.*

## (iii) Electricity and electrical energy

*To conduct experiments to generate heat, light, etc. from electric currents, and to discover that heat and light can be produced from electric currents and that the amount of heat or light produced varies according to the electric power.*

## (iv) Static electricity and electric currents

*To discover that static electricity is produced by rubbing different materials together, that forces can act across spaces between charged materials, and that static electricity and electric currents are related.*

## b. Electric currents and magnetic fields

## (i) Magnetic fields generated by electric currents

*To conduct observations of magnetic fields caused by magnets and electric currents, to understand that magnetic flux lines express magnetic fields, and to learn that a magnetic field is generated around a coil.*

## (ii) Forces on currents in magnetic fields

*To conduct experiments using magnets and coils, and to discover that forces act when electric current flows through a coil in a magnetic field.*

## (iii) Electromagnetic induction and generation of electricity

*To conduct experiments using magnets and coils, to discover that an electric current can be produced by moving a coil or magnet, and to understand the difference between direct current and alternating current.*

**4. Chemical Changes, Atoms and Molecules**

Through observations and experimentation regarding chemical changes, to foster an understanding of changes in substances such as chemical compounding and decomposition and their quantitative relationships, and to nurture a perspective and way of thinking that relates these facts and phenomena to atomic and molecular models.

## a. Constitution of substances

## (i) Decomposition of substances

*To conduct experiments in the decomposition of substances, and to discover that the components of the original substance can be deduced from the substances produced through decomposition.*

## (ii) Atoms and molecules

*To understand that matter consists of atoms and molecules, and to learn that atoms are expressed using symbols.*

## b. Chemical changes

## (i) Compounds

*To conduct experiments to combine two different substances, to discover that the reaction produces a different kind of substance, and to understand that chemical changes can be explained using atomic and molecular models, that the constitution of a compound is expressed using a chemical formula, and that a chemical change is expressed using a chemical reaction equation.*

## (ii) Oxidation and reduction

*To conduct experiments in oxidation and reduction, and to discover that oxygen is involved in reactions of oxidation and reduction.*

## (iii) Chemical changes and heat

*To conduct experiments in which heat is generated by chemical changes, and to discover that chemical changes can involve the generation or absorption of heat.*

## c. Chemical changes and mass

## (i) Chemical changes and preservation of mass

*To conduct experiments to measure the mass of substances before and after chemical changes, and to discover that the total mass of reactants is equal to the total mass of products.*

## (ii) Regularity of changes in mass

*To conduct experiments to measure the mass of substances related to chemical changes, and to discover that a certain relationship exists between the masses of the reacting substances.*

**5. Motion and Energy**

Through observations and experiments related to the movement and energy of objects, to foster an understanding of the regularity of the motion of objects and the fundamentals of energy, and to nurture an elementary perspective and way of thinking about motion and energy in relation to everyday life and society.

## a. Regularity of motion

## (i) Balance of forces

*To conduct experiments with two forces acting on an object and to discover the conditions occurring when the forces are balanced. In addition, to conduct experiments regarding the combination and resolution of forces and to understand the regularity of resultant forces and component forces.*

## (ii) Speed and direction of motion

*To conduct observations and experiments regarding the motion of objects, and to learn that motion includes speed and direction.*

## (iii) Forces and motion

*To conduct observations and experiments regarding the motion of objects with and without the action of forces, and to discover that with the action of a force, the speed of a moving object changes along with the direction of motion and passage of time; but that without the action of a force, a moving object continues to move in a straight line and at a constant speed.*

b. Mechanical energy

(i) Work and energy

*To conduct experiments regarding work, and to understand work and power. In addition, to conduct collision experiments, and to understand that the amount of energy possessed by an object can be measured as the work which that object can perform on another object.*

(ii) Preservation of mechanical energy

*To conduct experiments regarding mechanical energy, to discover the correlation between kinetic energy and potential energy, and to understand that the total amount of mechanical energy is preserved.*

**6. Chemical Changes and Ions**

Through observations and experiments regarding chemical changes, to foster an understanding of the electrical conductivity of aqueous solutions and neutralization reactions, and to nurture an elementary perspective and way of thinking about these facts and phenomena in relation to models of ions.

a. Aqueous solutions and ions

(i) Electrical conductivity of aqueous solutions

*To conduct experiments involving electric currents passed through aqueous solutions, and to discover that some aqueous solutions conduct electricity while others do not.*

(ii) Constitution of atoms and ions

*To conduct experiments in electrolysis, to discover that substances are generated at the electrodes, and to learn of the existence of ions. In addition, to learn that the generation of ions is related to the constitution of atoms.*

(iii) Chemical changes and batteries

*To conduct experiments using electrolyte aqueous solutions and two different types of metal, to discover that electric currents can be produced, and to learn that chemical energy is converted into electrical energy.*

b. Acids, bases and ions

(i) Acids and bases

*To conduct experiments to investigate the properties of acids and base, and to learn that the respective characteristics of acids and bases are caused by hydrogen ions and hydroxide ions.*

(ii) Neutralization and salts

*To conduct experiments in neutralization reactions, and to understand that water and salts are produced*

*when acids and bases are mixed.*

**7. Science, Technology and Human Beings**

To promote a deeper awareness of the relationship between human life and the use of energy resources and development of science and technology, and to foster the attitude of scientifically considering and judging issues of how to protect the natural environment and how to utilize science and technology.

a. Energy

(i) Types of energy and conversion

*Through observations and experiments regarding energy, to understand that various types of energy conversions are used in everyday life and society.*

(ii) Energy resources

*To learn that human beings obtain energy from hydroelectric, thermal, and nuclear power, and to develop an awareness of the importance of using energy effectively.*

b. Development of science and technology

(i) Development of science and technology

*To learn about the process of development of science and technology, and to develop an awareness of the comfort and convenience that science and technology have brought to human life.*

c. Protecting the natural environment and using science and technology

(i) Protecting the natural environment and using science and technology

*To scientifically consider how the natural environment should be protected and how science and technology should be used, and to develop an awareness of the importance of building a sustainable society.*