

Compulsory Concepts on Which Students May Be Tested in Science and Technology (555-410)

The scope of each concept is defined in the Progression of Learning.
Educational institutions are responsible for testing the concepts shown in *italics*.

The following are also evaluated: Techniques related to diagram drawing and graphic representation (multiview orthogonal projection, isometric representation, perspective drawing, use of scales).

The Living World	The Material World	The Technological World
<p>Ecology – Study of populations (density, distribution, biological cycles)</p> <p>Dynamics of communities – Biodiversity – Disturbances</p> <p>Dynamics of ecosystems – Trophic relationships – Primary productivity – Material and energy flow – Chemical recycling</p>	<p>Physical properties of solutions – Concentration (g/L, %, ppm) – Electrolytes – pH scale – Electrolytic dissociation – Ions – Electrical conductivity</p> <p>Chemical changes – Combustion – Photosynthesis and respiration (carbon cycle) – Acid-base neutralization reaction – Balancing chemical equations – Law of conservation of mass</p>	<p>Mechanical engineering – Characteristics of the linking of mechanical parts – Guiding controls – Construction and characteristics of motion transmission systems (friction gears, pulleys and belt, gear assembly, sprocket wheels and chain, wheel and worm gear) – Speed changes – Construction and characteristics of motion transformation systems (screw gear system, cams, connecting rods, cranks, slides and rotating slider crank mechanisms, rack-and-pinion drive)</p>
<p>The Earth and Space</p> <p>Biogeochemical cycles – Carbon cycle – Nitrogen cycle</p> <p>Climate zone – Factors that influence the distribution of biomes – Marine biomes – Terrestrial biomes</p> <p>Lithosphere – Minerals – Permafrost – Energy resources – Soil profile (horizons)</p> <p>Hydrosphere – Catchment area – Ocean circulation – Glacier and pack ice – Salinity – Energy resources</p> <p>Atmosphere – Greenhouse effect – Atmospheric circulation – Air mass – Cyclone and anticyclone – Energy resources</p> <p>Space – Solar energy flow – Earth-Moon system (gravitational effect)</p>	<p>Organization of matter – Rutherford-Bohr atomic model – Lewis notation – Groups and periods in the periodic table</p> <p>Electricity and electromagnetism – Electrical charge – Static electricity – Ohm's law – Electrical circuits – Relationship between power and electrical energy</p> <p>Electromagnetism – Forces of attraction and repulsion – Magnetic field of a live wire</p> <p>Transformation of energy – Law of conservation of energy – Energy efficiency – Distinction between heat and temperature</p>	<p>Electrical engineering – Power supply – Conduction, insulation and protection – Control – Transformation of energy (electricity and light, heat, vibration, magnetism)</p> <p>Materials – Constraints – Characteristics of mechanical properties – Types and properties – Plastics (thermoplastics, thermosetting plastics) – Ceramics – Composites – Modification of properties (degradation, protection)</p>

FORMULAS AND QUANTITIES

Science and Technology

FORMULAS

$$C = \frac{m}{V}$$

C : concentration
 m : quantity of solute
 V : quantity of solution

$$P = VI$$

P : electrical power
 V : potential difference
 I : electric current intensity

$$V = RI$$

V : potential difference
 R : resistance
 I : electric current intensity

$$E = P\Delta t$$

E : energy consumed
 P : electrical power
 Δt : time difference

$$\text{Energy efficiency (\%)} = \frac{\text{Amount of useful energy}}{\text{Amount of energy consumed}} \times 100$$

QUANTITIES

NAME	SYMBOL	VALUE
Density of water	ρ	1.0 g/mL or 1.0 kg/L or 1000 kg/m ³
Kilowatt-hour	kW·h	1 kW·h = 3 600 000 J