Observatory: The Environment, Second Year of Secondary Cycle Two Teacher's Guide B

SUPPORT ACTIVITIES – SECOND YEAR OF SECONDARY CYCLE TWO

Overview chart

The support activities for the second year of Secondary Cycle Two are grouped by student-book chapter. The title of each activity appears in the first column of the table below. The concepts covered in the activity are listed in the centre column. The third column identifies the relevant program or programs: ST for Science and Technology, EST for Environmental Science and Technology, AST for Applied Science and Technology and SE for Science and the Environment. Depending on the program content, two or three versions of an activity may be provided. For example, "The atom and atomic models" (Activity 1) is available in two versions—one for students in the ST program (compulsory concept: the Rutherford-Bohr atomic model) and one for students in the EST program (compulsory concepts: the Rutherford-Bohr atomic model, the simplified atomic model and the neutron). The content of the activities is not limited to the compulsory concepts of the programs, however; it also reflects the essential content of the *Observatory* student book.

Note: In many cases, the EST version of an activity can also be used in SE classes, as indicated in the table below.

Chapter 1: Atoms and elements

Activity title and number	Concepts	Programs
The atom and atomic models (Activity 1)	Rutherford-Bohr atomic model	ST
	Rutherford-Bohr atomic model, simplified atomic model, neutron	EST SE
The periodic table (Activity 2)	Groups and periods of the periodic table	ST
	Groups and periods of the periodic table, periodicity of properties, atomic number, relative atomic mass, isotopes	EST SE
Representing atoms (Activity 3)	Lewis notation, Rutherford-Bohr atomic model	ST
	Lewis notation, Rutherford-Bohr atomic model, simplified atomic model	EST SE
The concept of mole (Activity 4)	Concept of mole, Avogadro's number	EST SE

CHAPTER 2: Molecules and solutions

Activity title and number	Concepts	Programs
Molecules and ions (Activity 5)	Ions	ST
	Ions, polyatomic ions, types of bonds	EST SE
The rules of chemical notation and nomenclature (Activity 6)	Nomenclature and notation rules	EST SE
Solubility and concentration (Activity 7)	Concentration (ppm), concentration (g/L)	ST
	Concentration (ppm), concentration (g/L), concentration (mol/L)	EST SE
Electrical conductivity and pH (Activity 8)	Electrical conductivity, electrolytes, electrolytic dissociation, pH scale	ST SE
	Electrical conductivity, electrolytes, electrolytic dissociation, strength of electrolytes, salts, pH scale	EST

CHAPTER 3: Different forms of energy

Activity title and number	Concepts	Programs
Energy and energy efficiency (Activity 9)	Law of conservation of energy, energy efficiency	ST EST AST
Thermal energy (Activity 10)	Distinction between heat and temperature	ST AST
	Distinction between heat and temperature; specific heat capacity; relationship between heat energy, specific heat capacity, mass and temperature variations	EST SE
Kinetic energy, potential energy and mechanical energy (Activity 11)	Relationship between kinetic energy, mass and velocity; relationship between potential energy, mass, acceleration and travel	EST SE
Motions and forces (Activity 12)	Mass and weight, relationship between mass and weight, types of forces	EST
	Mass and weight; forces; types of forces; equilibrium of two forces; relationship between constant speed, distance and time	AST
Effective force and work (Activity 13)	Effective force; relationship between work, force and travel; relationship between work and energy	EST SE
Forces in fluids (Activity 14)	Archimedes' principle, Pascal's principle, Bernoulli's principle	AST

CHAPTER 4: Changes in matter

Activity title and number	Concepts	Programs
Balancing chemical equations (Activity 15)	Balancing chemical equations, law of conservation of mass	ST
	Balancing chemical equations, law of conservation of mass, stoichiometry	EST SE
Endothermic and exothermic reactions (Activity 16)	Endothermic and exothermic reactions	EST SE
Types of chemical change (Activity 17)	Acid-base neutralization reaction, oxidation, combustion, photosynthesis and respiration, precipitation	ST EST AST SE
Nuclear transformations (Activity 18)	Radioactivity, nuclear stability, fission and fusion	EST

CHAPTER 5: Electricity and magnetism

Activity title and number	Concepts	Programs
Electricity and electrical charges (Activity 19)	Electrical charge	ST AST
	Electrical charge, electrical field	EST
Static electricity (Activity 20)	Static electricity	ST AST
	Static electricity, Coulomb's law	EST
Dynamic electricity (Activity 21)	Relationship between power and electrical energy, Ohm's law	ST EST AST
Electrical circuits (Activity 22)	Electrical circuits	ST AST
	Electrical circuits, Kirchhoff's laws	EST
Magnetism and electromagnetism (Activity 23)	Forces of magnetic attraction and repulsion, magnetic field of a live wire	ST
	Forces of magnetic attraction and repulsion, magnetic field of a live wire, magnetic field of a solenoid	EST
	Forces of magnetic attraction and repulsion, magnetic field of a live wire, magnetic field of a solenoid, electromagnetic induction	AST

CHAPTER 6: The lithosphere and the hydrosphere

Activity title and number	Concepts	Programs
The lithosphere: minerals and rocks (Activity 24)	Minerals	ST EST AST
The lithosphere: soil (Activity 25)	Soil profile (horizons), permafrost	ST
	Soil profile (horizons), buffering capacity of soil, permafrost	EST SE
The lithosphere: energy resources (Activity 26)	Energy resources	ST AST
	Energy resources, soil depletion, contamination	EST SE
The hydrosphere and energy resources (Activity 27)	Watershed, salinity, ocean circulation, glaciers and pack ice, energy resources	ST EST
	Watershed, energy resources	AST
The hydrosphere and contamination (Activity 28)	Contamination, eutrophication	EST SE

CHAPTER 7: The atmosphere and space

Activity title and number	Concepts	Programs
The atmosphere: atmospheric pressure (Activity 29)	No compulsory concepts	ST EST SE AST
The atmosphere: atmospheric circulation (Activity 30)	Atmospheric circulation, air mass, anticyclone and depression	ST AST
	Atmospheric circulation (prevailing winds), air mass, anticyclone and depression	EST SE
The atmosphere: the greenhouse effect and energy resources (Activity 31)	Energy resources	AST
	Greenhouse effect, energy resources	ST
	Greenhouse effect, contamination, energy resources	EST SE
Solar radiation (Activity 32)	Solar energy flow	ST EST AST
The Earth-Moon system and the tides (Activity 33)	Earth-Moon system (gravitational effect)	ST EST AST

CHAPTER 8: The biosphere

Activity title and number	Concepts	Programs
The biosphere: biogeochemical cycles (Activity 34)	Carbon cycle, nitrogen cycle	ST
	Carbon cycle, nitrogen cycle, phosphorus cycle	EST
Biomes: factors determining biome distribution and terrestrial biomes (Activity 35)	Factors that influence the distribution of biomes	AST
	Factors that influence the distribution of biomes, terrestrial biomes	ST EST
Aquatic biomes (Activity 36)	Aquatic biomes	ST EST

CHAPTER 9: Populations and communities

Activity title and number	Concepts	Programs
Population size (Activity 37)	No compulsory concepts	ST EST
Populations: density and biological cycles (Activity 38)	Study of populations (density, biological cycles)	ST EST
Studying communities: biodiversity (Activity 39)	Dynamics of communities (biodiversity)	ST EST

CHAPTER 10: Ecosystems

Activity title and number	Concepts	Programs
Ecosystems and trophic relationships (Activity 40)	Dynamics of ecosystems (trophic relationships), ecosystems	ST EST AST
Ecosystem dynamics and disturbances (Activity 41)	Dynamics of ecosystems (material and energy flow, chemical recycling, primary productivity), disturbances	ST AST
	Dynamics of ecosystems (material and energy flow, chemical recycling, primary productivity), disturbances, ecological footprint	EST
Contamination (Activity 42)	Ecotoxicology (contaminant, toxicity threshold, bioconcentration, bioaccumulation), biodegradation of pollutants, wastewater treatment	EST SE

CHAPTER 11: Genetics

Activity title and number	Concepts	Programs
DNA and genes (Activity 43)	Character trait, gene	EST
Proteins and protein synthesis (Activity 44)	Protein synthesis	EST
Heredity (Activity 45)	Heredity, crossbreeding	EST
Alleles, genotypes and phenotypes (Activity 46)	Allele, dominance and recessivity, homozygote and heterozygote, genotype and phenotype	EST
Cloning (Activity 47)	Cloning	EST

CHAPTER 12: Manufacturing technical objects

Activity title and number	Concepts	Programs
Constraints and material deformations (Activity 48)	Constraints (deflection, shearing)	ST EST AST
Properties, degradation and protection of materials (Activity 49)	Characteristics of mechanical properties, modification of properties (degradation, protection)	ST EST AST
Wood, modified wood, ceramics, metals and alloys (Activity 50)	Types and properties (ceramics)	ST
	Types and properties (ceramics), heat treatments	EST AST
Plastics and composites (Activity 51)	Types and properties (plastics: thermoplastics, thermosetting plastics; composites)	ST EST AST
Projections and engineering drawings (Activity 52)	Axonometric projection: exploded view (reading), multiview orthogonal projection (general arrangement), dimensional tolerances	EST
	Multiview orthogonal projection (general arrangement), functional dimensioning, developments (prism, cylinder, pyramid, cone)	AST
Diagrams (Activity 53)	Standards and representations (diagrams, symbols)	AST
Manufacturing objects (Activity 54)	Shaping (machines and tools), manufacturing (characteristics of laying out, drilling, tapping and threading), direct measurement (vernier caliper)	EST
	Manufacturing (characteristics of tapping, threading and bending); direct measurement (vernier caliper); control, shape and position (plane, section, angle)	AST

CHAPTER 13: Mechanical engineering

Activity title and number	Concepts	Programs
Linking in technical objects (Activity 55)	Characteristics of linking of mechanical parts	ST
	Characteristics of linking of mechanical parts, (degrees of) freedom of movement	EST AST
Guiding controls (Activity 56)	Guiding controls	ST
	Guiding controls, adhesion and friction of parts	EST AST
Motion transmission systems (Activity 57)	Construction and and characteristics of motion transmission systems (friction gear, belt and pulley, gear train, chain and sprocket, worm and worm gear)	ST EST AST
Speed changes in motion transmission systems (Activity 58)	Speed changes	ST EST
	Speed changes, resisting torque, engine torque	AST
Motion transformation systems (Activity 59)	Construction and and characteristics of motion transformation systems (screw gear, connecting rods, cranks, slides, slider-crank mechanism, rack and pinion drive, cams)	ST
	Construction and and characteristics of motion transformation systems (screw gear, connecting rods, cranks, slides, slider-crank mechanism, rack and pinion drive, cams, eccentrics)	EST AST

CHAPTER 14: Electrical engineering

Activity title and number	Concepts	Programs
Electricity, electronics and electrical circuits (Activity 60)	No compulsory concepts	ST EST AST
Power supply, conduction, insulation and protection (Activity 61)	Power supply; conduction, insulation and protection	ST
	Power supply; conduction, insulation and protection (resistance and coding, printed circuit)	EST AST
Control and the transformation of energy (Activity 62)	Control, transformation of energy (electricity and light, heat, vibration, magnetism)	ST
	Typical controls (toggle, push-button, rocker, single-pole, double-pole, single-throw, double-throw), transformation of energy (electricity and light, heat, vibration, magnetism)	EST AST
Components with other functions (Activity 63)	Other functions (capacitor, diode)	EST
	Other functions (capacitor, diode, transistor, solid-state relay)	AST