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

CONCEPT REVIEWS

Overview chart

The handouts in this section present the concepts in the same order as in the student book. The title of each handout appears in the first column of the table below. The concept or concepts covered in the handout 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 a handout may be provided. For example, "Atoms and atomic models" (Concept review 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 handouts is not limited to the compulsory concepts of the programs; it encompasses the essential content of the *Observatory* student book.

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

Concept review	Concepts	Programs
1. Atoms and atomic models	Rutherford-Bohr atomic model	ST
	Rutherford-Bohr atomic model, simplified atomic model, neutron	EST SE
2. The periodic table	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
3. Representing atoms	Lewis notation, Rutherford-Bohr atomic model	ST
	Lewis notation, Rutherford-Bohr atomic model, simplified atomic model	EST SE
4. The concept of mole	Concept of mole, Avogadro's number	EST SE
5. Molecules and ions	Ions	ST
	Ions, polyatomic ions, types of bonds (ionic, covalent)	EST SE
6. The rules of nomenclature and notation	Nomenclature and notation rules	EST SE
7. Solubility and concentration	Concentration (ppm), concentration (g/L)	ST
	Concentration (ppm), concentration (g/L), concentration (mol/L)	EST SE
8. Electrical conductivity and pH	Electrical conductivity, electrolytes, electrolytic dissociation, pH scale	ST SE
	Electrical conductivity, electrolytes, electrolytic dissociation, strength of electrolytes, salts, pH scale	EST

CONCEPT REVIEWS – Overview chart (*continued*)

Concept review	Concepts	Programs
9. Energy and energy efficiency	Law of conservation of energy, energy efficiency	ST EST AST
10. Thermal energy	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
11. Kinetic energy, potential energy and mechanical energy	Relationship between kinetic energy, mass and velocity; relationship between potential energy, mass, acceleration and travel	EST SE
12. Motion and types of force	Mass and weight, relationship between mass and weight, types of forces	EST
	Mass and weight, force, types of forces, equilibrium of two forces, relationship between constant speed, distance and time	AST
13. Effective force and work	Effective force; relationship between work, force and travel; relationship between work and energy	EST SE
14. Forces in fluids	Archimedes' principle, Pascal's principle, Bernoulli's principle	AST
15. Balancing chemical equations	Balancing chemical equations, law of conservation of mass	ST
	Balancing chemical equations, law of conservation of mass, stoichiometry	EST SE
16. Endothermic and exothermic reactions	Endothermic and exothermic reactions	EST SE
17. Chemical changes	Acid-base neutralization reaction, oxidation, combustion, photosynthesis and respiration, precipitation	ST EST AST SE
18. Nuclear transformations	Radioactivity, nuclear stability, fission and fusion	EST
19. Electricity and electrical charges	Electrical charge	ST AST
	Electrical charge, electrical field	EST
20. Static electricity	Static electricity	ST AST
	Static electricity, Coulomb's law	EST
21. Electric current and electrical power	Relationship between power and electrical energy, Ohm's law	ST EST AST
22. Electrical circuits	Electrical circuits	ST AST
	Electrical circuits, Kirchhoff's laws	EST

CONCEPT REVIEWS – Overview chart (*continued*)

Concept review	Concepts	Programs
23. Magnetism and electromagnetism	Forces of attraction and repulsion, magnetic field of a live wire	ST
	Forces of attraction and repulsion, magnetic field of a live wire, magnetic field of a solenoid	EST
	Forces of attraction and repulsion, magnetic field of a live wire, magnetic field of a solenoid, electromagnetic induction	AST
24. The lithosphere: minerals and rocks	Minerals	ST EST AST
25. The lithosphere: soil	Soil profile (horizons), permafrost	ST
	Soil profile (horizons), buffering capacity of the soil, permafrost	EST SE
26. The lithosphere: energy resources	Energy resources	ST AST
	Energy resources, soil depletion, contamination	EST SE
27. The hydrosphere and energy resources	Watershed, salinity, ocean circulation, glacier and pack ice, energy resources	ST EST
	Watershed, energy resources	AST
28. Contaminating the hydrosphere	Contamination, eutrophication	EST SE
29. The atmosphere: atmospheric pressure	No compulsory concept	ST EST AST SE
30. The atmosphere: atmospheric circulation	Atmospheric circulation, air mass, cyclone and anticyclone	ST AST
	Atmospheric circulation (prevailing winds), air mass, cyclone and anticyclone	EST SE
31. The atmosphere: the greenhouse effect and energy resources	Greenhouse effect, energy resources	ST AST
	Greenhouse effect, contamination, energy resources	EST SE
32. Energy from the sun	Solar energy flow	ST EST AST
33. The Earth-Moon system and the tides	Earth-Moon system (gravitational effect)	ST EST AST
34. The biosphere: bio-geochemical cycles	Carbon cycle, nitrogen cycle	ST
	Carbon cycle, nitrogen cycle, phosphorus cycle	EST
35. Biomes: distribution factors and terrestrial biomes	Factors that influence the distribution of biomes	AST
	Factors that influence the distribution of biomes, terrestrial biomes	ST EST

CONCEPT REVIEWS – Overview chart (*continued*)

Concept review	Concepts	Programs
36. Aquatic biomes	Aquatic biomes	ST EST
37. Population size	No compulsory concept	ST EST
38. Population density and biological cycles	Study of populations (density, biological cycles)	ST EST
39. Communities and biodiversity	Dynamics of communities (biodiversity)	ST EST
40. Ecosystems and trophic relationships	Dynamics of ecosystems (trophic relationships), ecosystems	ST EST AST
41. Ecosystem dynamics and disturbances	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
42. Contamination	Ecotoxicology (contaminants, toxicity threshold, bioconcentration, bioaccumulation), biodegradation of pollutants, wastewater treatment	EST SE
43. DNA and genes	Character trait, gene	EST
44. Proteins and protein synthesis	Protein synthesis	EST
45. Heredity	Heredity, crossbreeding	EST
46. Alleles, genotypes and phenotypes	Allele, dominance and recessivity, homozygote and heterozygote, genotype and phenotype	EST
47. Cloning	Cloning	EST
48. Constraints and material deformations	Constraints (deflection, shearing)	ST EST AST
49. Properties and material degradation and protection	Characteristics of mechanical properties, modification of properties (degradation, protection)	ST EST AST
50. Wood, modified wood, ceramics, metals and alloys	Types and properties (ceramics)	ST
	Types and properties (ceramics), heat treatments	EST AST
51. Plastics and composites	Types and properties (plastics: thermoplastics, thermosetting plastics; composites)	ST EST AST
52. Projections and technical drafting	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

CONCEPT REVIEWS – Overview chart (*continued*)

Concept review	Concepts	Programs
53. Diagrams	Standards and representations (diagrams, symbols)	AST
54. Manufacturing objects	Shaping (machines and tools), manufacturing (characteristics of laying out, drilling, tapping and threading), direct measurement (vernier caliper)	EST
	Manufacturing (characteristics of drilling, tapping, threading and bending); direct measurement (vernier caliper); control, shape and position (plane, section, angle)	AST
55. Linking in technical objects	Characteristics of the linking of mechanical parts	ST
	Characteristics of the linking of mechanical parts, degrees of freedom of a part	EST AST
56. Guiding controls	Guiding controls	ST
	Guiding controls, adhesion and friction of parts	EST AST
57. Motion transmission systems	Construction and characteristics of motion transmission systems (friction gear, belt and pulley, gear train, chain and sprocket, worm and worm gear)	ST EST AST
58. Speed changes in motion transmission systems	Speed changes	ST EST
	Speed changes, resisting torque, engine torque	AST
59. Motion transformation systems	Construction and characteristics of motion transformation systems (screw gear systems, connecting rods, cranks, slides, slider-crank mechanisms, rack and pinion systems, cams)	ST
	Construction and characteristics of motion transformation systems (screw gear systems, connecting rods, cranks, slides, slider-crank mechanisms, rack and pinion systems, cams, eccentrics)	EST AST
60. Electricity, electronics and electrical circuits	No compulsory concept	ST EST AST
61. Power supply, conduction, insulation and protection	Power supply, conduction, insulation and protection	ST
	Power supply, conduction, insulation and protection (resistance and coding, printed circuit)	EST AST
62. Control and transformation of energy	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
63. Components with other functions	Other functions (capacitor, diode)	EST
	Other functions (capacitor, diode, transistor, solid-state relay)	AST