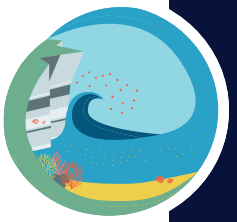

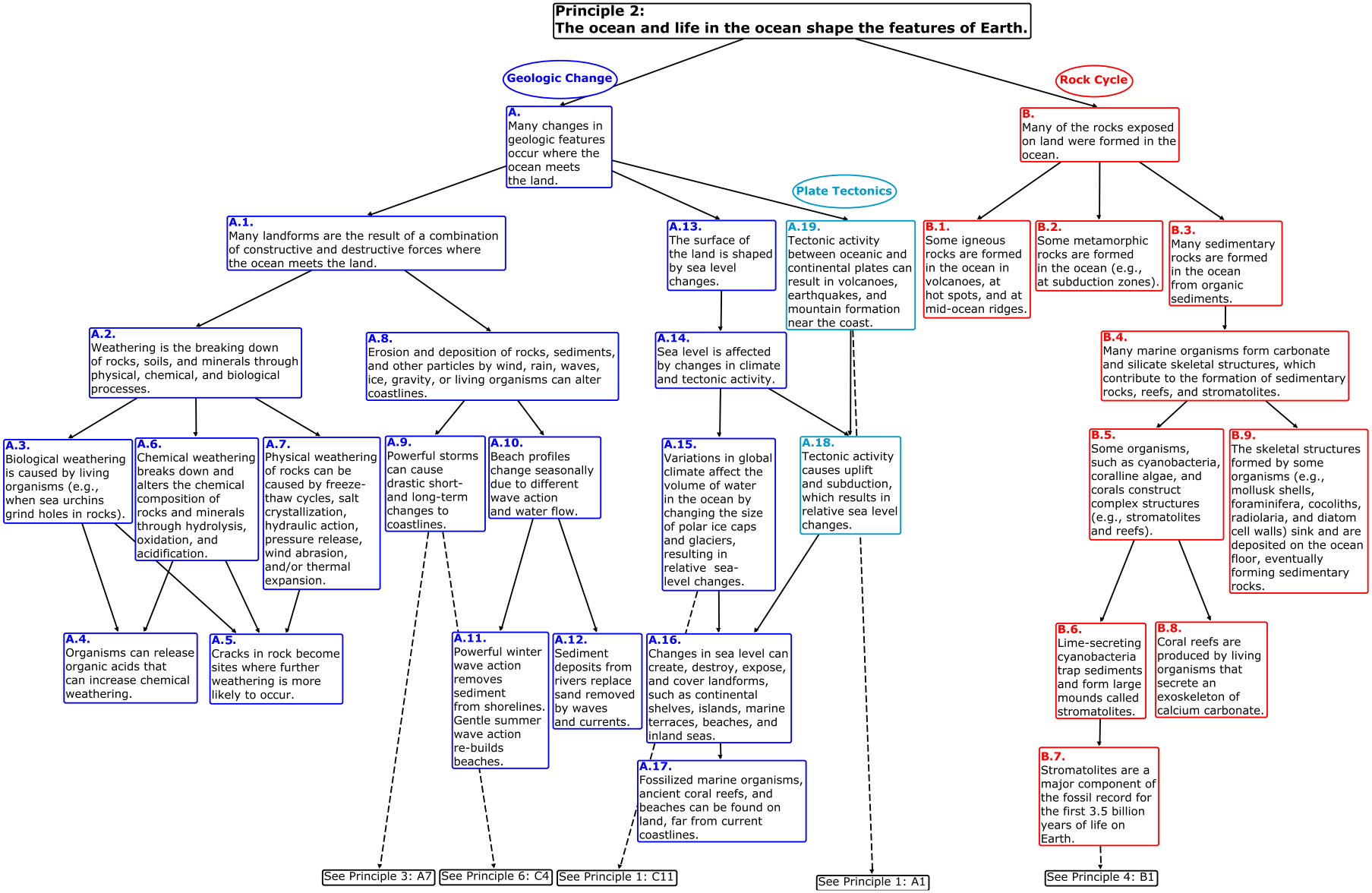
Principle 2:
The ocean and life in the ocean shape the features of Earth.
Geologic Change
Rock Cycle
Plate Tectonics
A. Many changes in geologic features occur where the ocean meets the land.
B. Many of the rocks exposed on land were formed in the ocean.
A.1. Many landforms are the result of a combination of constructive and destructive forces where the ocean meets the land.
A.13. The surface of the land is shaped by sea level changes.
A.19. Tectonic activity between oceanic and continental plates can result in volcanoes, earthquakes, and mountain formation near the coast.
B.1. Some igneous rocks are formed in the ocean in volcanoes, at hot spots, and at mid-ocean ridges.
B.2. Some metamorphic rocks are formed in the ocean (e.g., at subduction zones).
B.3. Many sedimentary rocks are formed in the ocean from organic sediments.
A.2. Weathering is the breaking down of rocks, soils, and minerals through physical, chemical, and biological processes.
A.8. Erosion and deposition of rocks, sediments, and other particles by wind, rain, waves, ice, gravity, or living organisms can alter coastlines.
A.14. Sea level is affected by changes in climate and tectonic activity.
B.4. Many marine organisms form carbonate and silicate skeletal structures, which contribute to the formation of sedimentary rocks, reefs, and stromatolites.
A.3. Biological weathering is caused by living organisms (e.g., when sea urchins grind holes in rocks).
A.6. Chemical weathering breaks down and alters the chemical composition of rocks and minerals through hydrolysis, oxidation, and acidification.
A.7. Physical weathering of rocks can be caused by freeze-thaw cycles, salt crystallization, hydraulic action, pressure release, wind abrasion, and/or thermal expansion.
A.9. Powerful storms can cause drastic short- and long-term changes to coastlines.
A.10. Beach profiles change seasonally due to different wave action and water flow.
A.15. Variations in global climate affect the volume of water in the ocean by changing the size of polar ice caps and glaciers, resulting in relative sea-level changes.
A.18. Tectonic activity causes uplift and subduction, which results in relative sea level changes.
B.5. Some organisms, such as cyanobacteria, coralline algae, and corals construct complex structures (e.g., stromatolites and reefs).
B.9. The skeletal structures formed by some organisms (e.g., mollusk shells, foraminifera, cocoliths, radiolaria, and diatom cell walls) sink and are deposited on the ocean floor, eventually forming sedimentary rocks.
A.4. Organisms can release organic acids that can increase chemical weathering.
A.5. Cracks in rock become sites where further weathering is more likely to occur.
A.11. Powerful winter wave action removes sediment from shorelines. Gentle summer wave action re-builds beaches.
A.12. Sediment deposits from rivers replace sand removed by waves and currents.
A.16. Changes in sea level can create, destroy, expose, and cover landforms, such as continental shelves, islands, marine terraces, beaches, and inland seas.
B.6. Lime-secreting cyanobacteria trap sediments and form large mounds called stromatolites.
B.8. Coral reefs are produced by living organisms that secrete an exoskeleton of calcium carbonate.
A.17. Fossilized marine organisms, ancient coral reefs, and beaches can be found on land, far from current coastlines.
B.7. Stromatolites are a major component of the fossil record for the first 3.5 billion years of life on Earth.
See Principle 3: A7
See Principle 6: C4
See Principle 1: C11
See Principle 1: A1
See Principle 4: B1