Overview of Part 2 of course (Oceans, Solid Earth, and the Biosphere)

As you study for this test, it will be helpful for you to read the material in the book that is associated with each of the figures that I showed in class. In addition, it will be helpful if you read the figure captions, and make sure that you understand the important points that are conveyed in the figures. Below is a summary of material that you should know. You will not be held responsible for the material that is highlighted in red. Material that is extremely important, is highlighted in blue.

Lecture 13, February 17 – Ocean Atmosphere Coupling
Winds and surface currents p 83-85
Convergence p 85-86
Upwelling and downwelling p 86-87
Geostrophic flow p 87
Boundary currents p 87-88
Vorticity p 89-90
Ocean circulation and sea-surface temperature p 88 and p 90

Lectures 14/15 February 20/22 – Thermohaline Circulation, Part 1
Circulation of the deep ocean
Salinity p 91-92
Thermohaline circulation p 92-95
Bottom water formation p 95-96
The thermohaline conveyor belt p 96, p 99-101
Useful concepts (isotopes) p 97-98
Ocean circulation and climate p 101

Lecture 16, February 24 – Modeling the Atmosphere/Ocean System
Why numerical models p 104-106
General circulation models p 106
General circulation models p 107-108
Using models for climate experiments p 109
Equilibrium climate change experiments p 109-111
Transient climate change experiments p 111
Can we trust what models tell us? p 111-113
Dependence on initial conditions p 113-114
Are the model results usable? p 114-115

Lecture 17/18, February 27/March 1 – Solid Earth, Plate Tectonics
Overview p 117-118
Introduction p 118
Seismic probing of Earth’s interior p 118-121
Generalized structure of Earth p 121-123
The crust (no need to memorize all the types of rocks) p 123-124
The mantle p 124-125
The core p 125-126
The theory of plate tectonics
Sea-floor spreading p 126-128
Continental drift and paleogeographic reconstructions p 128-132
New structural categories p 132
Plates and plate boundaries p 133
Divergent margins p 133
Convergent margins p 134
Oceanic/continental and oceanic/oceanic convergent margins p 135-136
Continental/continental convergent margins p 136
What drives plate tectonics? p 137-139
Convection in the mantle p 139-141
Radiometric dating of geologic materials p 140
Forces acting on plates p 141
The rock cycle p 141
Weathering and erosion p 141-142
Sediment accumulation p 142
Uplift p 143
Metamorphism and melting p 143
The rock cycle p 143
Plate tectonics through Earth history p 143-145

Lecture 19/20, March 3/6 – The Carbon Cycle
Systems approach to the carbon cycle p 147-148
A journey through the terrestrial carbon cycle p 148-149
Carbon reservoir dynamics p 149-150
Reservoirs p 150-151
Steady state p 151-152
Residence time p 152
Oxidized and reduced carbon p 152
The short-term organic carbon cycle p 153-154
The marine organic carbon cycle on short time scales p 154-157
Oxygen minimum zone p 155
The biological pump p 157
Nutrient limitation p 157-158
The long-term organic carbon cycle p 158
Carbon burial in sedimentary rocks p 158-159
Carbon leaks and oxygen replacement p 159
Formation of fossil fuel p 159-160
The sedimentary organic carbon reservoir p 160
Weathering of organic carbon in sedimentary rocks p 160-161
Summary of the organic carbon cycle p 161
The inorganic carbon cycle p 161
Carbon exchange between ocean and atmosphere p 161-162
The chemistry of inorganic carbon in water p 162
Carbonic acid, bicarbonate, and carbonate equilibrium p 162-164
Chemical weathering p 164
Summary of the inorganic carbon cycle p 165-167
Net removal of CO$_2$ from the ocean and atmosphere p 167
The carbonate-silicate geochemical cycle p 167-168
Long-term feedbacks in the carbonate-silicate cycle p 168-170
Links between the organic and inorganic carbon cycle p 170

Lectures 21/22/23, March 8,10,13 – Biota – Metabolism, Ecosystems, and Biodiversity
Characteristics of life p 173-174
Autotrophs and heterotrophs p 174-175
Structure of the biosphere p 175
Ecosystems p 175-180
Species interactions p 180-182
Ecosystem disturbance and succession p 183
Biodiversity p 183
Measures of biodiversity p 184
Diversity of stability p 184
Diversity of interactions p 185

Some Important terms (not necessarily all of the important ones!)
Ekman spiral, Ekman transport, upwelling, downwelling, geostrophic current (geostrophy), salinity, thermohaline circulation, pycnocline, halocline, thermocline, deep ocean water, radiometric dating, global climate model (or general circulation model), continental drift, earthquake, seismic waves, crust, mantle, lithosphere, asthenosphere, magnetic field, mid-ocean ridge, sea-floor spreading, polarity, divergence, convergence, subduction, convection, weathering, erosion, rock cycle, biosphere, organic carbon, inorganic carbon, nutrients, Redfield Ratio, reservoir, steady state, residence time, photosynthesis, biomass, methanogenesis, producers, consumers, photic zone, biological pump, fossil fuel, autotrophs, heterotrophs, species, population, community, ecosystem, biome, ecotone, food chain, symbiosis, biodiversity