

Teaching Practical Topics

(Presentations will be 15 minutes long)

Cosmological Prospective

1. The age of the universe, observations and inferences about the Big Bang, synthesis of elements in the stars and supernovas. Accretion of solar system material into planets, including times scales.
2. What is the age of the earth, how do we estimate it. What important events occurred in the Earth's first 10^8 years. Compare atmospheric and internal properties between the different planets and discuss why there are difference/similarities.
3. Theories for origin of the moon and data used to determine the correct one. The origin, composition, and importance of the Earth's core. When did the core form? How do we know?

Earth Structure

4. Dimensions and general properties of the Earth's major layers (crust/mantle/core) and rheological structures (lithosphere/asthenosphere), including ranges of temperatures and pressures and basic chemical composition.
5. Modes of thermal transport in boundary layers and within the major layers.
6. How do we know the properties of the core? Why is inner core solid? Discuss the earth's magnetic field. What basic tools do we use to learn deep earth properties.

Plate Tectonics

7. What is the major history of ideas underlying continental drift? What is a plate and what are the major types of plate boundaries?
8. How fast do plates move? What forces lead to plate motion? What tools are used to determine this? What types of stresses and faulting exist in different tectonic environments? How are earthquakes and volcanoes related to plate motions?
9. How are oceanic plates different from continental plates? What causes melting in different plate tectonic environments? What roles do plate formation and destruction play in the chemical evolution of the mantle and crust?
10. How do/did continents form? How do mountains form? What are major tectonic events that occurred through geologic time? What is the Wilson Cycle?
11. How are rocks and geological processes radiometrically dated?

History of Life and the Earth

12. Discuss the origination of life on Earth. What was life like during the Achaean? What transitions in life took place during the Proterozoic?
13. What evolutionary advances are likely to have spurred the Cambrian explosion? What has caused the major mass extinctions that punctuate the geologic time scale? What evidence is used to support this?

Surface Processes

14. Through what processes do rock break down or weather? What are typical end products of the weathering of basalt and granite? How can we determine average erosion rates for entire continents?
15. What are some common depositional environments for sediments and what are the major types of sedimentary rocks? Where have the most extensive sequences of sedimentary rocks been deposited? How and where do fossil fuels form? Explain the concept of residence time.

Climate Change on Earth

16. What are stable vs. radiogenetic isotopes and what do both tell us about past climate variations?
17. Orbital variations, discuss obliquity, precession, periodicity, and eccentricity. What are Milankovitch cycles?
18. What is the history of ice ages? When and why have there been long, warm intervals with no ice caps? How common is it to have ice on the poles? Discuss what sort of feedbacks exist in the climate system. What processes can change sea level over time?
19. How has the isotopic composition of the ocean changed through time? What are the possible reasons for these changes besides climate change?
20. What controls Earth's surface temperature? What processes drive atmospheric and ocean circulation? What is the evidence for global warming in the past century?