

SOME SUGGESTED TOPICS FOR TERM PAPER

1. ORIGIN OF THE SOLAR SYSTEM/UNIVERSE

Age of the universe from uranium and thorium isotopes
The use of chondritic meteorites to study the formation of the solar system
The origin of different types of meteorites
Planetary geochemistry: Mars, Moon, Jupiter satellites, SNC meteorites, etc.
Planetary atmospheres (Venus or Mars)
Condensation sequences (for planetary/star formation)
History of the early solar system (extinct nuclides)
Age of the Earth/solar system

2. DIFFERENTIATION OF THE EARTH

Continental crust formation and history
Mantle mineralogy and transitions
Core formation, composition, and/or history
Iron formations and the history of atmospheric O₂
Early zircons/ $\delta^{18}\text{O}$ and age, implications for early surface water

3. AQUEOUS GEOCHEMISTRY

Evaporate deposits and precipitation sequences
Hydrothermal vent chemistry (mid-ocean ridges, Yellowstone)
What controls the ocean's chemical composition
Carbon cycling/buffering (a) ocean/atmosphere (b) weathering
Methane clathrates (solid compounds containing methane on the sea floor) and climate change or energy

4. PETROLOGY

Trace element partitioning during partial melting and melting models
Geothermometry/Geobarometry

5. GLOBAL CLIMATE CHANGE

Ice core $\delta^{18}\text{O}$ records

Marine $\delta^{18}\text{O}$ record (sea level and temperature changes)
Cave $\delta^{18}\text{O}$ records (speleothems)
Dating of corals/sea level change
Sr/Ca thermometry of corals
 ^{13}C as a tracer for plant migration/climate change from soils/cave deposits
 ^{14}C timescale/development and calibration
Atmospheric CO_2 history and ties to ocean chemistry
Ice core CH_4 records and the atmospheric methane cycle
Ice core dust records

6. OTHER ISOTOPIC GEOCHEMISTRY

Isotopic tracers in subduction zone volcanic arcs (e.g. ^{10}Be)
Ar/Ar Dating and tracer techniques (e.g. story of human evolution)
U/Th Dating (e.g. sea level history)
Sm/Nd and Rb/Sr (e.g. history of the mantle)
U/Pb (e.g. age of the earth)
Isotopic evidence for snowball earth and the evolution of multicellular life (e.g. $\delta^{13}\text{C}$ in Proterozoic carbonates)

7. OTHER TOPICS

Pb pollution of the earth's surface
K-T boundary – Evidence supporting a bolide impact (e.g. Ir anomaly)
The snowball Earth hypothesis and cap carbonates
Permo-Triassic boundary – evidence for what caused this larger extinction
Chemical weathering and atmospheric CO_2
Modeling Atmospheric CO_2 (future climate predictions or past history)