

TAMU GEOL 101 – Comprehensive Exam 1 Cheat Sheet

ORIGIN OF UNIVERSE & EARTH

Big Bang: 13.7 Ga (Universe forms)
Nebular Theory: Solar system from rotating solar nebula
Earth age: 4.6 Ga

Formation sequence: Collapse → Spinning disk → Proto-sun → Planetaryimals → Planets

Chemical differentiation: Dense Fe-Ni sank → Core formed → Mantle + crust layered by density

EARTH SYSTEMS

Geosphere	Solid Earth
Hydrosphere	Liquid water
Atmosphere	Gases
Cryosphere	Ice
Biosphere	Life

Steady State: Input = Output
 Output ↓ Input → depletion
 Input ↓ Output → accumulation

Uniformitarianism: Present = key to past

EARTH STRUCTURE (COMPOSITIONAL)

Crust	Oceanic: Basalt, 8 km, 3.0 g/cm ³ Continental: Granite, 30–70 km, 2.7 g/cm ³
Mantle	Peridotite (largest by volume)
Outer Core	Liquid Fe-Ni
Inner Core	Solid (pressure)

Thickest sphere: Geosphere

Geothermal gradient: Temp ↑ with depth

PHYSICAL LAYERS

Lithosphere = crust + upper mantle (rigid plates)
 Asthenosphere = ductile/plastic
 Mesosphere = lower mantle
 Boundary (lith/asth) = temperature-controlled

SEISMIC WAVES

P-wave	Solids + liquids
S-wave	Solids only
No S-wave in outer core → liquid	

Felsic 66–76%

Magma temp: 650–1100°C

BASALTIC vs FELSIC

	Basaltic	Felsic
Silica	Low	High
Viscosity	Low	High
Density	High	Low
Temp	High	Lower
Volcano	Shield	Stratovolcano
Color	Dark	Light

Mafic = Mg, Fe rich

Felsic = Si, Al rich

ROCK TYPES

Igneous = cooling magma/lava
 Sedimentary = lithified sediment
 Metamorphic = heat + pressure (solid state)

Metamorphic grade: Slate → Phyllite → Schist → Gneiss
 Sandstone → Quartzite
 Limestone → Marble

WEATHERING & SEDIMENT

Mechanical = frost wedging
 Chemical = acid reaction
 $\text{Rainwater} + \text{CO}_2 \rightarrow \text{carbonic acid}$
 Grain size: Gravel ↓ Sand ↓ Silt ↓ Clay
 Glacial deposits = very poorly sorted

FAULTS & DEFORMATION

Fault = fracture + displacement
 Joint = no displacement
 Elastic deformation = returns to shape
 Brittle deformation = faults
 Reverse fault = compression
 Normal fault = tension
 Strain = result of stress

KEY NUMBERS

Earth age: 4.6 Ga
 Universe age: 13.7 Ga
 Oceanic crust density: 3.0 g/cm³
 Continental crust density: 2.7 g/cm³

MAGMA PROPERTIES

Temp ↑	Viscosity ↓
Silica ↑	Viscosity ↑
Volatiles ↑	Explosivity ↑
Silica content: Ultramafic 38–45% Mafic 45–52% Intermediate 52–66%	