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## Geol 250 – Exam Three

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The exam will use a pyramid testing technique and will consist of two parts: an individual exam and a group discussion exam. The individual exam will consist of 25 two-point questions, 3 five-point questions and one 10 point question (total=75 points). The group discussion exam will consist of 25 one-point questions taken from the individual test (total=25 points). A discussion group may not contain more than 4 students. If you finish your individual exam before other students, please sit quietly and wait for the second part of the exam; do NOT take out any other material or communicate with other students.

No notes, electronic devices or any other material may be taken out during the class meeting during which the exam is administered. If your cell phone or other electronic device goes off (i.e., makes noise) during any part of the exam, your exam will be collected and you will be asked to leave. If you are observed handling anything other than a writing utensil and your exam papers (e.g., electronic devices, folders, bags, etc.), your exam will be confiscated and you will be asked to leave. You may not communicate in any way with other students during the individual exam time. Further actions are at the discretion of the professor.

### Topics Covered:

There will be three metric conversion questions. Please see the example test questions document for examples.

The 10-point question will be: Briefly explain how the “Greenhouse Effect” keeps the Earth’s troposphere warmer than it would be if there were no “Greenhouse gases.”

**Minerals:** definition of a mineral (naturally occurring, inorganic, homogeneous solid, definite chemical composition, ordered atomic arrangement), crystal form (symmetry), cleavage (symmetry and directions of cleavage), fracture, color (reasons color is frequently useless), streak color, luster (metallic, non-metallic), hardness (Mohs Hardness Scale), tenacity, specific gravity (density), acid test, magnetism; mineral classification (native elements, sulfides and sulfates, oxides, silicates, carbonates, others), most common elements in Earth’s crust (silicon, oxygen, aluminum, magnesium, sodium, potassium, calcium, iron); major rock forming minerals (quartz, feldspar, pyroxene (augite), amphibole (hornblende), muscovite, biotite, clay minerals, calcite, gypsum, halite, hematite, magnetite, galena, sphalerite, olivine, garnet), gemstones.

**Igneous rock and processes:** geothermal gradient, radioactive decay, original heat, magma, Bowen’s Reaction Series (continuous series olivine – pyroxene – amphibole – biotite – muscovite+quartz, discontinuous series Ca-rich plagioclase feldspar – Na-rich plagioclase feldspar – K-feldspar), mafic composition, felsic composition; igneous rock texture, phaneritic, aphanitic, porphyritic, glassy, vesicular, pyroclastic; crystalline igneous rocks (basalt, gabbro, andesite, diorite, rhyolite, granite), non-crystalline igneous rocks (scoria, obsidian, pumice), plutonic versus volcanic igneous rocks, plutons.

**Weathering:** physical (mechanical) weathering, unloading exfoliation, ice wedging, abrasion; chemical weathering, acid/base reactions, hydration/dehydration, oxidation/reduction reactions, hydrolysis (chemical breakdown of silicate minerals reacting with water to form clay minerals and dissolved ions); eventual production of quartz sand and clay clasts.

**Sedimentary rocks and processes:** clastic versus non-clastic sedimentary rocks; clastic sedimentary rocks, weathering (clast production, Wentworth grain size scale); transportation of clasts, clast sorting, clast rounding, clast mineral composition, wind transportation, transportation by streams (bed load, suspended load, dissolved load); deposition (proximal versus distal depositional environments), lithification (compaction, cementation, pore space); chemical (non-clastic) sedimentary rocks, evaporites (e.g., rock halite and rock gypsum), carbonates (limestone), siliceous sedimentary rocks (chert and opal), coal (lignite, bituminous coal).

**Metamorphic rocks and processes and the rock cycle:** protoliths (rock being metamorphosed), factors affecting metamorphism: temperature (controlled by geothermal gradient and tectonic setting, upper limit of metamorphism), fluids (increased pressure with increased temperature, moves ions and heat around), pressure (controlled by load and fluid pressure), deviatoric stress (controls foliation and lineation); foliation (orientation of flat mineral by deviatoric stress): slaty cleavage (foliation – forms slate), schistosity (foliation plus formation of new minerals – forms schist), gneissic banding (foliation plus growth of new minerals plus segregation of minerals by shape – forms gneiss); non-foliated metamorphic rocks (containing no flat or pointy minerals, e.g., anthracite, quartzite, marble). The rock cycle