QUIZ 1

1) What are two ways that petrologists attempt to overcome the accessibility problem of igneous and metamorphic processes? (2 pts)
   A) Set up experiments to simulate ig/met processes
   B) Develop theoretical models to “
   C) Make interpretations from empirical (field and petrographic) observations

2) Name two things that petrologists want to know about magmas. (2 pts)
   Composition, source material, temperature of formation, physical properties (e.g., viscosity)
   ...

3) Arrange the names of the physical and chemical layers of the earth in their proper sequence – top down (3 pts).

<table>
<thead>
<tr>
<th>Physical Layers</th>
<th>Chemical Layers</th>
<th>Terms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top</td>
<td>Crust</td>
<td>asthenosphere</td>
</tr>
<tr>
<td>Lithosphere</td>
<td>Mantle</td>
<td>mantle troposphere</td>
</tr>
<tr>
<td>Asthenosphere</td>
<td>Core</td>
<td>mesosphere core</td>
</tr>
<tr>
<td>Mesosphere</td>
<td>Liquid Core</td>
<td>liquid core solid core</td>
</tr>
<tr>
<td>Liquid Core</td>
<td>Solid Core</td>
<td>lithosphere xenosphere</td>
</tr>
</tbody>
</table>

4) What are two ways that we can get an estimate of the composition of the earth’s mantle? (2 pts)
   Chondritic Meteorites, Xenoliths, Seismic data, Density modelling

5) The processes of Plate Tectonics can be thought of as a two stage distillation process to make the Earth’s continental crust.
   A) What is distilled in the first stage? Mantle (1 pt)
   B) What is distilled in the second stage? Oceanic Crust (1 pt)

6) Name two important goals of any useful classification scheme for igneous rocks. (2 pts)
   Practical, Descriptive (non-genetic), Systematic, Hierarchical, Natural

7) While the mineralogy of an igneous rock may tell us about the composition of the magma from which it crystallized, what does texture tell us? (1 pt) The manner by which it cooled and crystallized.
8) In addition to a modal rock name, name two other descriptors that are useful to completely describing a rock. (2 pts) Alteration, Foliation/Layering, Absolute Grain Size, Bulk Rock Texture – based on pyroxene habit, Accessory/Minor Minerals

9) Name three essential minerals by which mafic rocks are commonly classified (1.5 pts)  
   Plagioclase, Olivine, Pyroxene

10) Name three essential minerals by which felsic rocks are typically classified (1.5 pts)  
    Quartz, Plagioclase, Alkali Feldspar

11) How do we classify igneous rocks that are too fine-grained or altered to determine their mineralogy? (1 pt) By their chemistry (e.g. Total Alkali-Silica plot) or by calculating their CIPW normative mineral composition from a whole rock analysis and plotting essential mineral compositions

12) The proportions of what three components are commonly used to classify pyroclastic rocks? (1.5 pts) Ash/Lapilli/Block&Bombs or Glass/Rock Fragments/Crystals

13) Fill in the table below with relative terms of low, intermediate, or high for the physical properties of magmas (3 pts)

<table>
<thead>
<tr>
<th>General Magma Type:</th>
<th>Ultramafic</th>
<th>Mafic</th>
<th>Intermediate</th>
<th>Felsic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature:</td>
<td>High</td>
<td>High</td>
<td>Int.</td>
<td>Low</td>
</tr>
<tr>
<td>Viscosity:</td>
<td>Low</td>
<td>Low</td>
<td>Int.</td>
<td>High</td>
</tr>
<tr>
<td>Gas Content:</td>
<td>Low</td>
<td>Low</td>
<td>Int.</td>
<td>High</td>
</tr>
</tbody>
</table>

14) What magma type usually erupts effusively? (1 pt) mafic or ultramafic

15) What role does magma decompression play in triggering explosive eruptions? (1 pt) During eruption, the drop in pressure lowers the solubility (carrying capacity) of water and other volatiles in the magma and causes gas to rapidly unmix from the magma

16) Compositionally, what is a major difference between shield volcanoes and stratovolcanoes? (1 pt) Shield volcanoes are mostly composed of basalt whereas stratovolcanoes are composed of a mix of lava and pyroclastic rock types.
17) Name two physical features that you might find in a subaerially erupted plateau basalt. (2 pts)
   Pahoehoe, AA, flow toe lobes, amygdaloidal/vesicular flow tops, columnar joints

18) Name a physical feature that you might find only in a submarine-erupted basalt. (1 pt)
   Pillow structures

19) What is the general rock name for pyroclastic deposits? (1 pt) Tuff

20) For the different intrusion forms listed below, what level of the crust would you most likely find them, the upper crust or the lower crust? (1.5 pts)
   Dikes and sills Upper  Ring Cones Upper  Batholith Lower

21) How might one determine whether an intrusion is syn-tectonic or post-tectonic? (1 pt)
   In a syn-tectonic intrusion, the margins of the intrusion tend to be sub parallel to the structure in the country rock; in a post-tectonic intrusion, the margins commonly cross cut the country rock structures

22) Circle the appropriate attribute of intrusions in the epizone and the catazone of the crust in the table below. (3 pts)

<table>
<thead>
<tr>
<th></th>
<th>Epizone</th>
<th>Catazone</th>
</tr>
</thead>
<tbody>
<tr>
<td>A) Ductility of the Crust</td>
<td>ductile / brittle</td>
<td>ductile / brittle</td>
</tr>
<tr>
<td>B) Concordancy of Intrusion Contacts</td>
<td>concordant / discordant</td>
<td>concordant / discordant</td>
</tr>
<tr>
<td>C) Thermal metamorphic gradient</td>
<td>strong / weak</td>
<td>strong / weak</td>
</tr>
</tbody>
</table>

23) Name a couple mechanisms by which magmas are emplaced into the crust. (2 pts).
   Stoping, Doming of Roof, Wall rock melting/assimilation, ductile wall rock flow (diapirism), emplacement into extensional environment, lateral displacement by folding or faulting

24) Large igneous intrusions are typically composite intrusions, formed by multiple injections into the magma chamber. What evidence would you look for in an intrusion that would indicate its composite nature? (1 pt) Abrupt changes in rock type, texture, or composition within an intrusion.