Study guide for the metamorphic rock exam

Practical

1. Know your optical mineralogy and how to determine all common properties of minerals in thin section.
   A. Basic optical indicatrix type: isotropic, uniaxial, biaxial.
   B. Optic sign.
   C. 2V.
   D. Sign of elongation.
   E. Extinction angle of elongate crystals (e.g., micas, amphiboles, pyroxenes, apatite, chlorite).
   F. Sign of dispersion.
   G. Birefringence estimation.
   H. Pleochroism.

2. Refractive index relative to adjacent minerals. This especially applies to finding untwined K-feldspar amongst quartz and plagioclase.

3. Be able to identify common metamorphic rocks by eye.

4. Be able to make a reasonably accurate identification of large (>1 mm), common minerals in hand samples.

5. Be able to identify in thin section all of the minerals seen in the metamorphic Minerals lab. This can be done with a book, like Tröger or DHZ, but it will slow you down. No computers.

6. Be able to assign protoliths to common metamorphic rocks based on rock mineralogy and textures.

7. Be able to interpret mineral textures in terms of reactions, and be able to identify mineral assemblages seen in thin section on appropriate ternary phase diagrams.

Theoretical

1. Be able to accurately calculate the temperature and pressure at any depth being given the depth, rock density, geothermal gradient, and surface temperature.

2. Be able to sketch reasonably accurate Pressure-Temperature-time paths for rocks during metamorphism if given a set of P and T estimates or tectonic events.

3. Understand how continuous and discontinuous reactions work.

4. Be able to schematically identify or illustrate divariant, univariant, or invariant reactions on P-T or ternary phase diagrams.

5. Know how to graphically make projections of phase diagrams, and the reasons for making them.

6. Understand the concept of metamorphic isograds and know some of the more common ones.

7. Know the approximate P-T areas occupied by different metamorphic facies (typically basaltic rocks) and metamorphic grades or zones (typically pelitic rocks).

8. Understand and be able to explain the stress-strain curves of brittle faults, the two types of ductile faults, and the effect each type of fault has on fault width.

9. Be able to use an appropriate petrogenetic grid (a P-T diagram showing reaction lines) to determine the range of P and T that any particular assemblage could have formed in.

10. Know the definitions of common geological terms, such as those we used frequently in class and lab.