

Problem Set #1
due Mon, 2/09/09

Please answer the following questions carefully. Please write neatly or type. These questions are designed to encourage you to think critically about the material covered in class and focus your attention on especially important ideas.

***Problem sets will often be due the class before an exam, to encourage you to use these questions to begin studying—because of this you will usually need to make copies of your answers if you want to use them while studying immediately prior to the exam.*

Problem sets will be graded on the following scale:

- 0 (not submitted)
- 1 (incomplete, poorly written, many errors)
- 2 (complete with some errors)
- 3 (well written and no more than 1 or 2 minor errors)

Plate Tectonics:

1. **Discuss** the 4 main lines of evidence that Alfred Wegener used to support his theory of continental drift.
2. What is the difference between the theory of plate tectonics and the theory of continental drift?
3. What is the difference between the lithosphere and the asthenosphere?
4. **Explain** how a rock can record information about the Earth's magnetic field.
5. What are the three main types of plate boundaries? What are real-life examples of each type?
6. When two oceanic plates meet at a convergent plate boundary, what factor determines which plate will be subducted?
7. When a continental plate converges with an oceanic plate, why does the oceanic plate subduct but not the continental plate?

Minerals

1. What are the 5 characteristics that a substance must possess to be a mineral?
2. **Explain** the difference between ionic, covalent, and metallic bonding.
3. **Explain** why color and crystal form might not be the most useful physical properties to use to identify a mineral.

4. **Explain** the difference between cleavage and crystal form.
5. **List** 4 common light silicate and 4 common dark silicate minerals.
6. What are the two most common elements found in the Earth's crust?
7. **Explain** why some minerals cleave and some minerals fracture?
8. If you found a ring with a clear stone in it while walking on campus, how would you tell if you had a diamond or a piece of cut quartz?

Igneous Rocks

1. What is the main factor that determines the texture of an igneous rock?
2. Explain how an igneous rock might obtain a porphyritic texture.
3. What do the words felsic and mafic mean refer to?
4. Of the 3 chemical categories of igneous rocks (granitic, intermediate, basaltic), which:
 - a. Has the highest silica content?
 - b. Is most often found at divergent plate boundaries?
 - c. Is the darkest in color?
 - d. Often contains potassium feldspars?
 - e. Often has a salt-and-pepper appearance?
5. Explain how magma tends to form at divergent plate boundaries versus how magma tends to form at convergent plate boundaries. Be sure to discuss the role of pressure and/or the role that volatiles play in the formation of magma.
6. Discuss 3 ways that the chemical makeup of a magma chamber can change or evolve over time.
7. According to Bowen's reaction series, which type of igneous rocks form last in a cooling body of magma - granitic, intermediate, or basaltic?
8. What kind of igneous rock textures form in extrusive igneous environments? What textures form in intrusive environments?