Igneous Rock Mineral Size

Part 1: Forming Minerals
The size of minerals in an igneous rock is determined by how long the magma takes to cool. To illustrate, everyone should stand up and scatter throughout the room.

1) You have 2 seconds to form groups as big as possible. How many per group? ______

2) Scatter again. Now you have 10 seconds. How many per group? ______

3) Two students are debating about how this activity relates to mineral size in rocks.

Student 1: *It seems to me that with a longer amount of time, it is possible for all the atoms to form really large minerals.*

Student 2: *I don't know, I would think that more time, means that more minerals will form, and only a little bit of time means only a few big minerals will form.*

With which student do you agree? Why?

Part 2: Mineral Formation Location
Two bodies of magma are shown in cross section below. One is above ground and the other is deep within the crust. The arrows represent heat escaping from the molten rock as it cools.

4) Which will cool faster? Lava erupted onto the surface Magma deep underground

5) The igneous rocks granite and gabbro have large minerals. In which location would they have formed?
   on the surface deep in the crust

6) The igneous rocks rhyolite and basalt have minerals so small it is difficult to distinguish them with the naked eye. In which location would they have formed?
   on the surface deep in the crust
7) Circle the two rocks that formed deep in the crust.

Granite  Rhyolite  Basalt  Gabbro

Check your answer with your answers for Questions 5 and 6.

Part 3: Porphyry

8) The igneous rock to the right has large, light colored minerals and many small, dark minerals. You can tell it is an igneous rock because the minerals inside are rectangular and not rounded like sediments. How might the igneous rock shown to the right have formed?

9) Two students are debating about the cooling rate of this rock and the formation of the large minerals.

Student 1: The magma must have gotten large pieces of sediments that we can see trapped in it, and the sediments didn’t melt even though they were in the magma. So, this rock formed because large pieces of sediment got picked up by lava, and then that lava cooled quickly.

Student 2: This is an igneous rock, so everything started off as magma. The large minerals must have formed deep underground when the magma was cooling slowly, like in a magma chamber. But the rest of the rock has very small minerals, so they cooled quickly at the surface.

With which of these students do you agree? Why?

10) Student 2 said that the large minerals formed deep underground, like in a magma chamber, and the small minerals formed at the surface. Describe what actually happened to form the rock. In other words, what story does this rock tell about its history?

(hint to Question 10: in what situation is magma from a magma chamber moved to the surface?)