

What happens to a rock during subduction-related metamorphism?

Assume the rock entering the subduction zone is a greenstone that has experienced prehnite-pumpellyite facies metamorphism (rock A). This rock will encounter increasing pressure and temperature as it is subducted changing first into a blueschist (rock B) and finally into eclogite (rock C). Answer the questions below to determine what happens to both the density of the rock and the H₂O that is mineralogically bound in the rock.

Mineral abundances in volume percent

Minerals	<i>Greenstone</i>	Minerals	<i>Blueschist</i>	Minerals	<i>Eclogite</i>
Chlorite	30%	Chlorite	25%	Omphacite	45%
Albite	25	Albite	25	Garnet	35
Illite	10	Phengite	10	Phengite	10
Prehnite	10	Lawsonite	15		
Pumpellyite	15	Glaucophane	15		
Calcite	10	Aragonite	10	Aragonite	10

1. Write the mineral formula for each mineral in the table below. Based on what you know about the minerals (chemistry, structure) attempt to list the silicate minerals in these rocks in order of increasing density.

Minerals	Idealized mineral formula
Chlorite	
Albite	
Illite	
Prehnite	
Pumpellyite	
Calcite	
Phengite	
Lawsonite	
Glaucophane	
Aragonite	
Omphacite	
Garnet	

2. Write the densities of each of the minerals in the table below. Please use units of g/cm^3 . For minerals that are solid solutions, use an average density.

Minerals	Density (g/cm^3)
Chlorite	
Albite	
Illite	
Prehnite	
Pumpellyite	
Calcite	
Phengite	
Lawsonite	
Glaucophane	
Aragonite	
Omphacite	
Garnet	

3. Calculate the density of each rock using the volume percent minerals present and the density of those minerals.

Greenstone _____

Blueschist _____

Eclogite _____

4. How does density change during progressive subduction zone metamorphism?

5. Generally speaking, what happens to the H_2O content of the rocks during progressive subduction zone metamorphism?