

**ERSC 3P21**

Igneous and  
Metamorphic  
Petrology

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**PETRO (rock).....**

- **Petrography**  
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- **Petrology**  
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- **Petrogenesis**  
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**PETRO.....**

- Petrographic, petrologic and petrogenetic , studies can be applied to igneous, metamorphic and sedimentary rocks
- Petrography and petrology became important in geology in the mid 19<sup>th</sup> Century with the development of the microscope and the thin section to aid in the description of various rock types

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**IGNEOUS ROCKS**

**Defined**

- 



The image shows six photographs of igneous rock samples arranged in a 2x3 grid. Each sample is shown with a coin for scale. The top row shows three samples: a light-colored, crystalline rock; a dark, reddish-brown rock with a coarse texture; and a dark, fine-grained rock. The bottom row shows three more samples: a light-colored, crystalline rock; a dark, reddish-brown rock with a coarse texture; and a dark, fine-grained rock.

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**MAGMA**

**Defined:**

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- Magma may or may not contain:
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Kilauea lava flowing into Pacific Ocean



From: Globe and Mail, 08/15/02 David Jordan/AP

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**MAGMA**

**LIQUID PHASE**

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**MAGMA**

**GAS PHASE**

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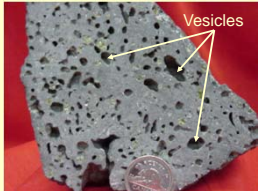
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**MAGMA**

**GAS PHASE**

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USGS Photo by Arnie Proff, May 28, 1991

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**MAGMA**

**SOLID PHASE**

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**Igneous Rocks**

- Igneous rocks are not everywhere abundant on and/or within the Earth, they lack large scale mineral deposits
- Igneous activity (volcanism) provides the only samples available with which we may directly study the composition of the Earth's interior
- Samples the lower crust and upper mantle the outer ~100 km

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**Igneous Rocks**

- Igneous rocks are extremely variable –
- 2 Possibilities to explain this link:
  1. \_\_\_\_\_ or
  2. \_\_\_\_\_

(the latter is only applicable to restricted locality)

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### Igneous Rocks

- Source compositions are sufficiently different, with each composition undergoing similar process(s) after derivation
- These processes, which can effectively change the composition and character of the magma, are termed \_\_\_\_\_ or \_\_\_\_\_ mechanisms
- **Defined:** -

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### Generalities Concerning Magmas

**COOLING**

1.  
-  
  
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### Generalities Concerning Magmas

**COOLING**

2.  
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3.  
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4.  
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**Generalities Concerning Magmas**

**MAGMATIC TEMPERATURES**

Extruded Magmas = \_\_\_\_\_

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- 
- \_\_\_\_\_
  - Observed temperature range 900-1500°C, commonly 1000-1200°C
- \_\_\_\_\_
  - Observed range 700-1000°C, commonly ~ 800°C

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**Generalities Concerning Magmas**

**MAGMATIC TEMPERATURES**

Intruded Magmas = \_\_\_\_\_

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- \_\_\_\_\_ crystallize at ~800-1000°C
- \_\_\_\_\_ crystallize at ~ 600°C

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**Generalities Concerning Magmas**

**RATES OF ASCENT AND COOLING**

These are related to the structure and physical characteristics of the magma body,

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- Ascent
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- Cooling
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