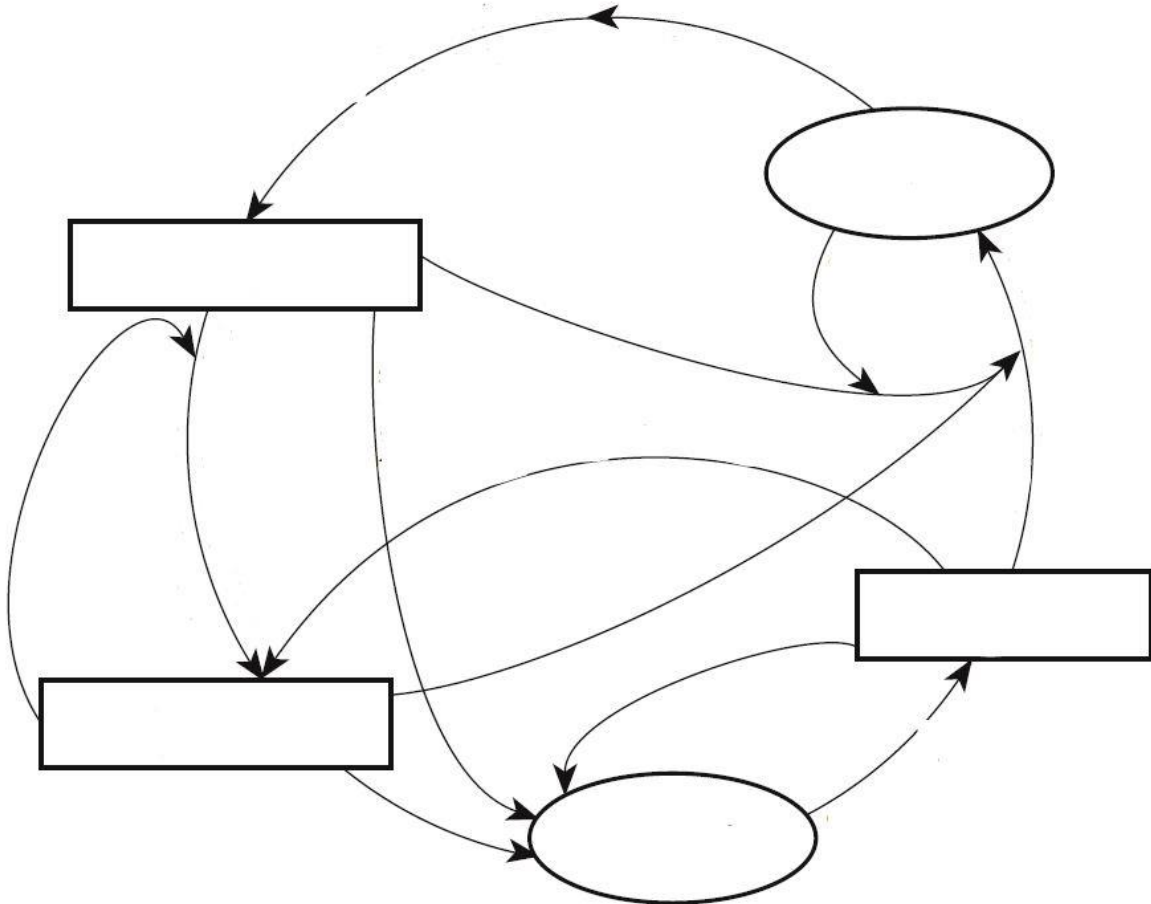


Section 4: Metamorphic Rocks

Rock Cycle in Earth's Crust



Section 4 Question: How do Metamorphic Rocks form and what characteristics does this produce?

What Do You See?

What Do You Think?

What factors are responsible for changing a rock from one kind to another?

Where does metamorphism occur?

What Do You Think Now?

Focus Question A: How does foliation form in a metamorphic Rock?

Observe:

Claim

Evidence

Focus Question B: How do you classify a metamorphic rock?

Examine rock samples

List ways that you can divide them in groups:

Separate samples into categories you decided to use

List the rocks by their sample number that you placed in each category:

Describe difficulties you experienced:

Compare your classification with categories used by other groups and add categories to your list that you had not thought about.

Extend:

Refer to page 7 of *ESRT Scheme for Metamorphic Rock Identification*

Use the table to identify your samples by name

Scheme for Metamorphic Rock Identification

TEXTURE		GRAIN SIZE	COMPOSITION	TYPE OF METAMORPHISM	COMMENTS	ROCK NAME	MAP SYMBOL
FOLIATED	MINERAL ALIGNMENT	Fine	<div style="display: flex; flex-direction: column; align-items: center;"> <div style="width: 10px; height: 100%; background-color: #cccccc; margin-bottom: 2px;">MICA</div> <div style="width: 10px; height: 100%; background-color: #cccccc; margin-bottom: 2px;">QUARTZ</div> <div style="width: 10px; height: 100%; background-color: #cccccc; margin-bottom: 2px;">FELDSPAR</div> <div style="width: 10px; height: 100%; background-color: #cccccc; margin-bottom: 2px;">AMPHIBOLE</div> <div style="width: 10px; height: 100%; background-color: #cccccc; margin-bottom: 2px;">GARNET</div> <div style="width: 10px; height: 100%; background-color: #cccccc; margin-bottom: 2px;">PYROXENE</div> </div>	Regional (Heat and pressure increases) 	Low-grade metamorphism of shale	Slate	
		Fine to medium			Foliation surfaces shiny from microscopic mica crystals	Phyllite	
	BANDING	Medium to coarse			Platy mica crystals visible from metamorphism of clay or feldspars	Schist	
					High-grade metamorphism; mineral types segregated into bands	Gneiss	
NONFOLIATED	Fine	Carbon	Regional	Metamorphism of bituminous coal	Anthracite coal		
	Fine	Various minerals	Contact (heat)	Various rocks changed by heat from nearby magma/lava	Hornfels		
	Fine to coarse	Quartz	Regional or contact	Metamorphism of quartz sandstone	Quartzite		
		Calcite and/or dolomite		Metamorphism of limestone or dolostone	Marble		
	Coarse	Various minerals	Pebbles may be distorted or stretched	Metaconglomerate			

<p>Sample Name:</p> <p>1.</p> <p>2.</p> <p>3.</p> <p>4.</p> <p>5.</p>	<p>6.</p> <p>7.</p> <p>8.</p> <p>9.</p>
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Explain:

How do geologists classify metamorphic rocks?

Describe similarities between your classification scheme and that of the ESRT.

RETURN TO WDYTN

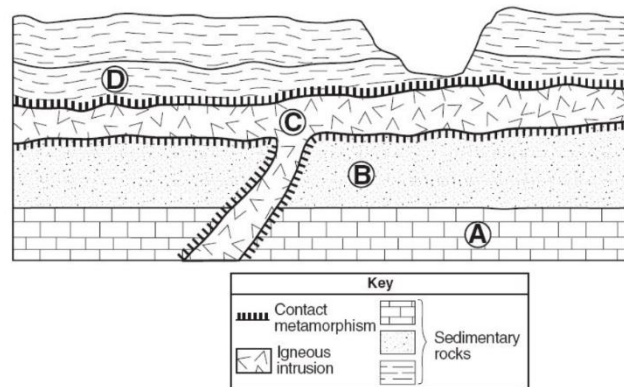
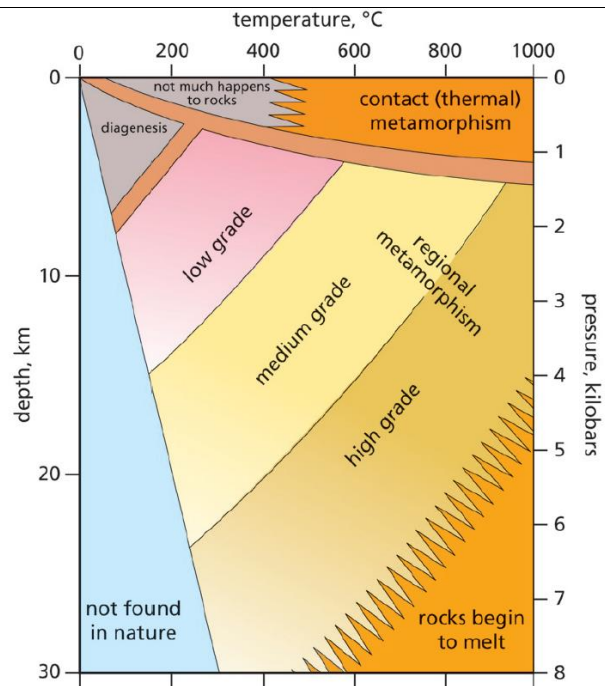
DIGGING DEEPER

Formation of Metamorphic Rocks

- Metamorphic Rocks undergo a physical change when they are exposed to different temperatures and pressures
- A protolith is the rock from which a metamorphic rock has formed
- Regional metamorphism occurs over large areas affecting large volumes of rocks
- Regional Metamorphic creates 4 metamorphic rocks as a result on increasing pressure
 - Slate
 - Phyllite
 - Schist
 - Gneiss
- Contact metamorphism occurs in smaller areas where hot magma intrudes surrounding rock

In what types of settings to metamorphic rocks form?

What two changes can occur during metamorphism?



Foliation in Metamorphic Rocks

- Foliation is the tendency for a metamorphic rock to split along parallel planes
 - Foliation is formed when mica crystals grow parallel to one another forming weak areas in the rock
 - Foliation can also appear as bands of alternating light and dark bands
- Rocks that do not contain Micas or other platy minerals do not form foliation

Highlight the foliations in each image below and label it with the correct metamorphic rock name.



Chapter 3, Section 4 E.B.C.
Metamorphic Rocks

Name: _____
Period: _____

Question (2)			
Claim 1 (2)			
A. Supporting Evidence (3)		B. Supporting Evidence (3)	
Claim 2 (2)			
A. Supporting Evidence (3)		B. Supporting Evidence (3)	
Analysis (6)			
	Claim <i>A statement or conclusion that answers the original question/problem.</i>	Evidence <i>Scientific data that supports the claim. The data needs to be appropriate and sufficient to support the claim.</i>	Analysis <i>A justification that connects the evidence to the claims. It shows why the data counts as evidence by using appropriate and sufficient scientific principles and vocabulary.</i>
0	Does not make a claim, or makes an inaccurate claim.	Does not provide evidence, or only provides inaccurate or vague evidence.	Does not provide an analysis, or only provides an irrelevant analysis.
1	Makes an accurate but vague or incomplete claim.	Provides vague evidence and does not include specific data.	Repeats evidence and links it to claim, but does not include specific scientific principles.
2	Makes accurate and complete claim.	Provides correct evidence but does not include specific data.	Connects all evidence to the claims using scientific principles or vocabulary but not both.
3		Provides correct evidence and includes specific data.	Connects all evidence to both claims using scientific principles and vocabulary.

CHECKING UP: Page 311, 1 through 3 (2 points each)

1.

2.

3.

In what region(s) of New York are metamorphic rocks located? What are the names of these rocks? Why do you think they are located there? (Hint: Page 3 of the ESRT) (5 points)