Chapter

3.3 Sedimentary Rocks

Be able to…

Describe the major process that forms this rock.

Sedimentary rocks are made out of sediments, I sed- it and -I ment it!

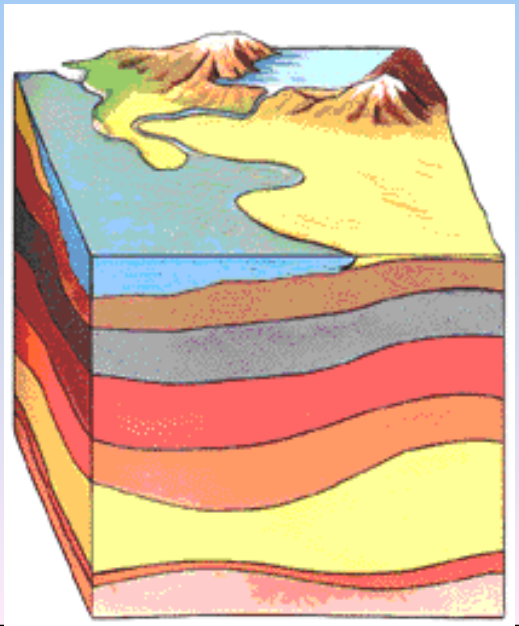


Figure 9 Sedimentary Rocks in Canyonlands National Park, Utah The rocks shown here formed when sand and other sediments were deposited and cemented. Weathering processes created this arch.

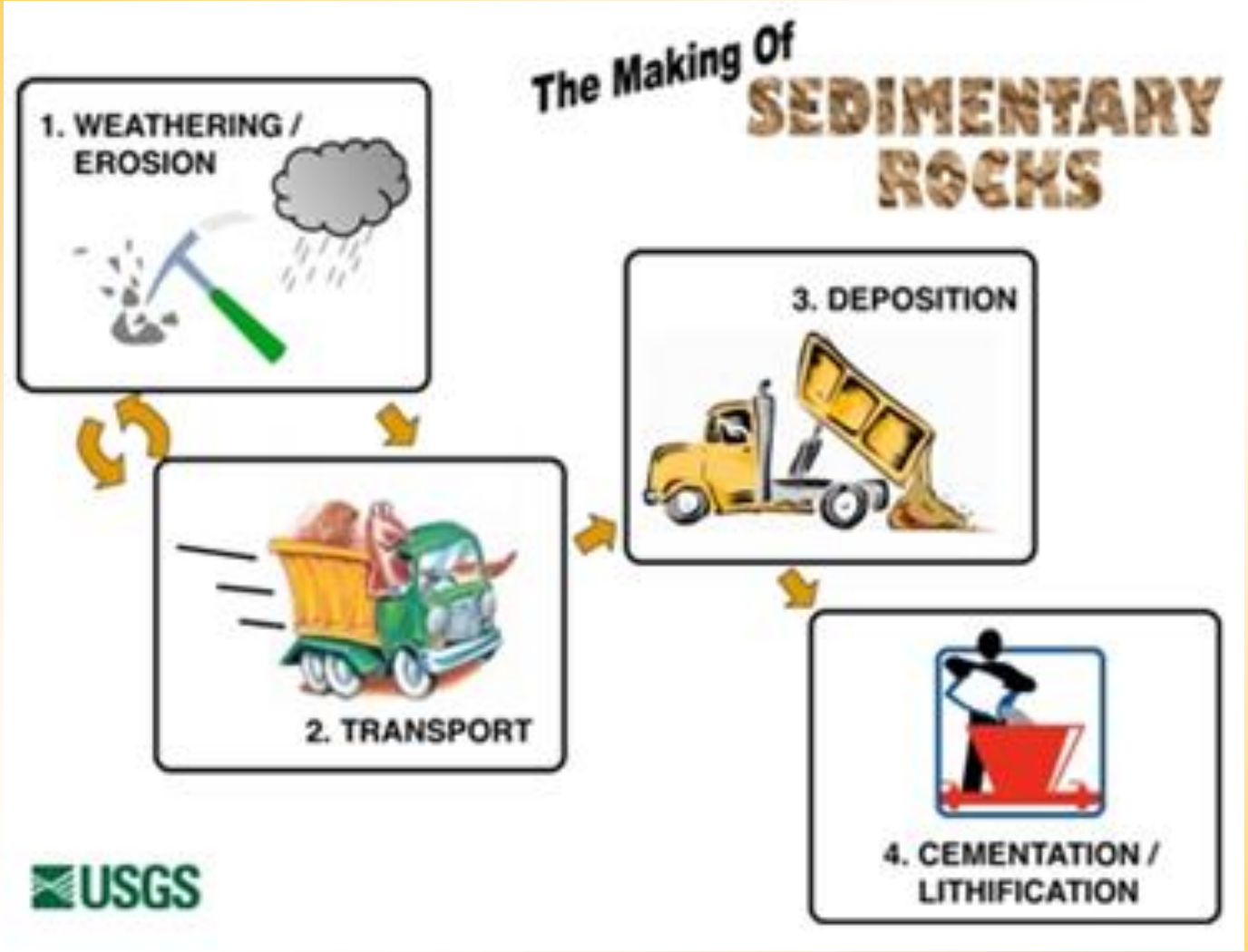
3.3 Formation of Sedimentary Rocks

- Weathering, Erosion, and Deposition
  - **Erosion** involves the weathering and the removal of rock.
  - **Deposition** occurs when an agent of erosion—water, wind, ice, or gravity—loses energy and drops sediments.

3.3 Formation of Sedimentary Rocks

Compaction and Cementation

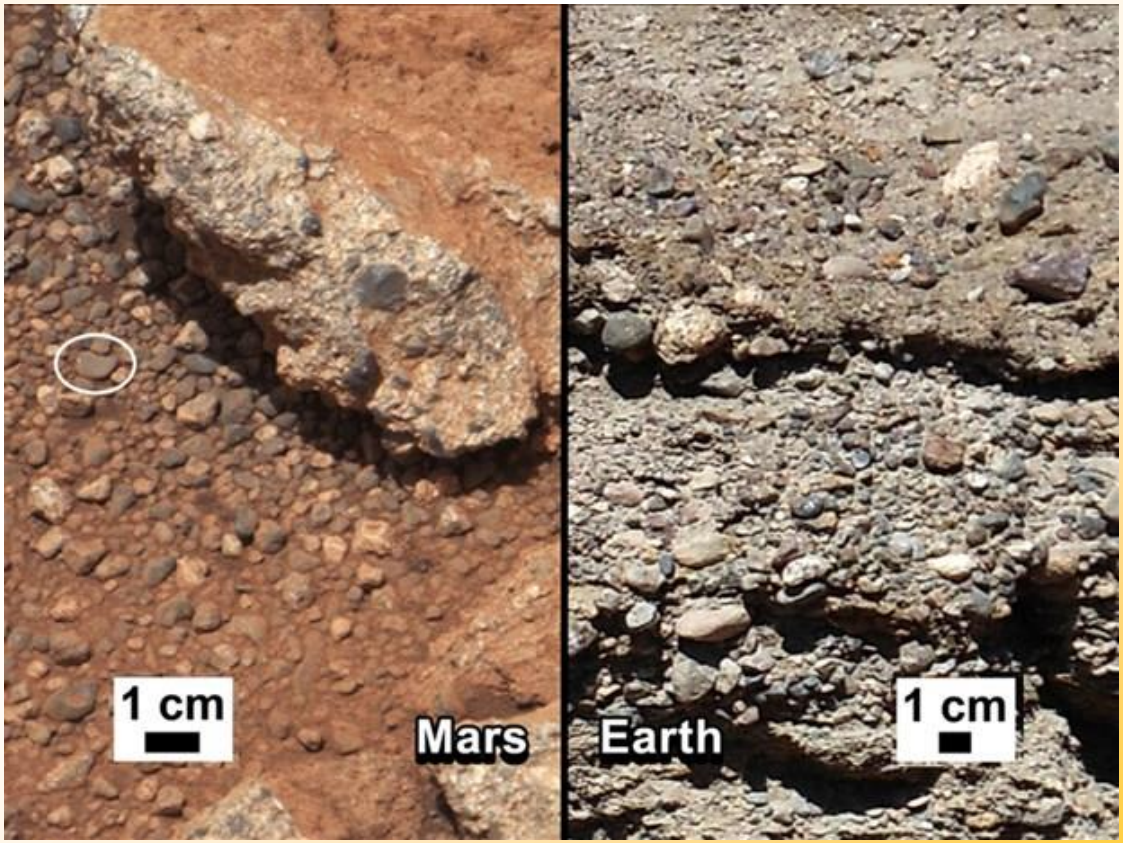
- **Compaction** is a process that squeezes, or compacts, sediments.
- **Cementation** takes place when dissolved minerals are deposited in the tiny spaces among the sediments.


The Making Of
SEDIMENTARY ROCKS
1. WEATHERING / EROSION
2. TRANSPORT
3. DEPOSITION
4. CEMENTATION / LITHIFICATION
USGS

Shale with Plant Fossils

Mars Rocks 2012

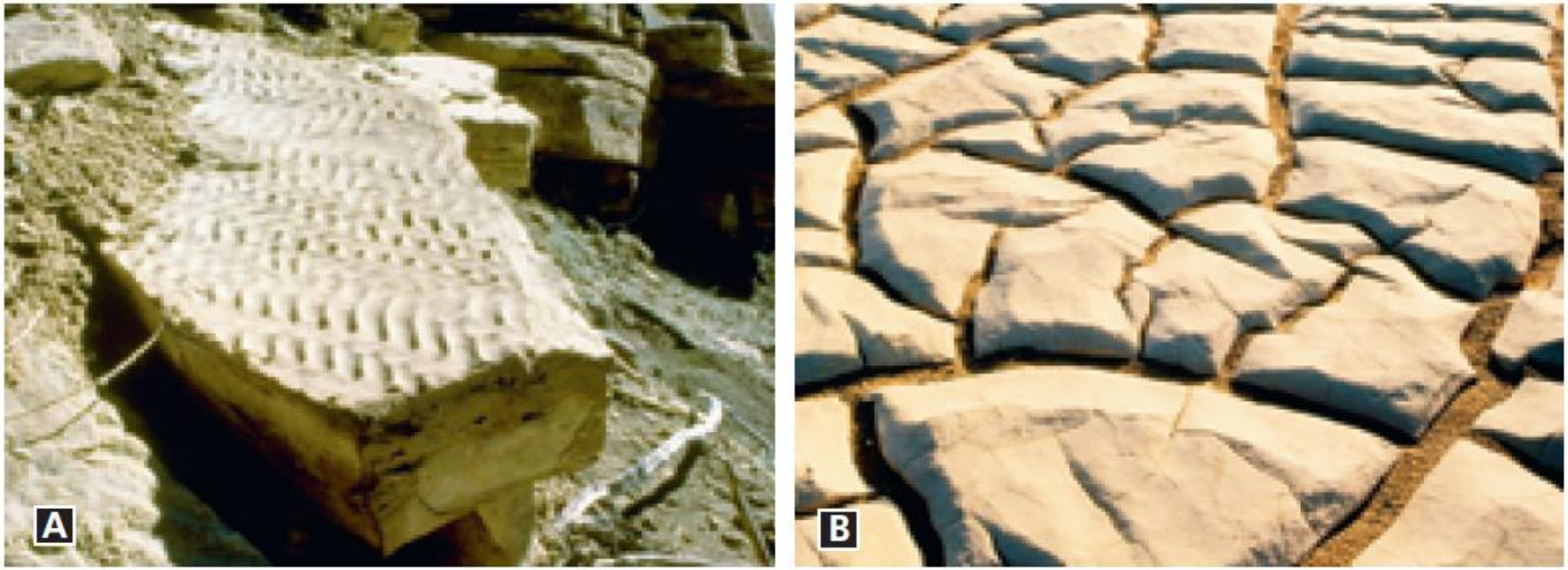
Figure 10 Although these two rocks appear quite different, both formed when sediments were dropped by moving water. **A** Conglomerate is made of rounded pebbles cemented together. **B** Sandstone is made of sand grains cemented together.



Fossiliferous Limestone

Figure 12 This biochemical rock, called coquina, is a type of limestone that is made of hundreds of shell fragments.

Figure 13 **A** Ripple marks and **B** mud cracks are features of sedimentary rocks that can be used to learn about the environments in which the rocks formed.



Chapter

3.4 Metamorphic Rocks

Be able to…

- *Identify the agents of metamorphism.*
- *Compare and contrast foliated and nonfoliated metamorphic rocks.*

3.4 Formation of Metamorphic Rocks

- ***Metamorphism*** means “to change form.”

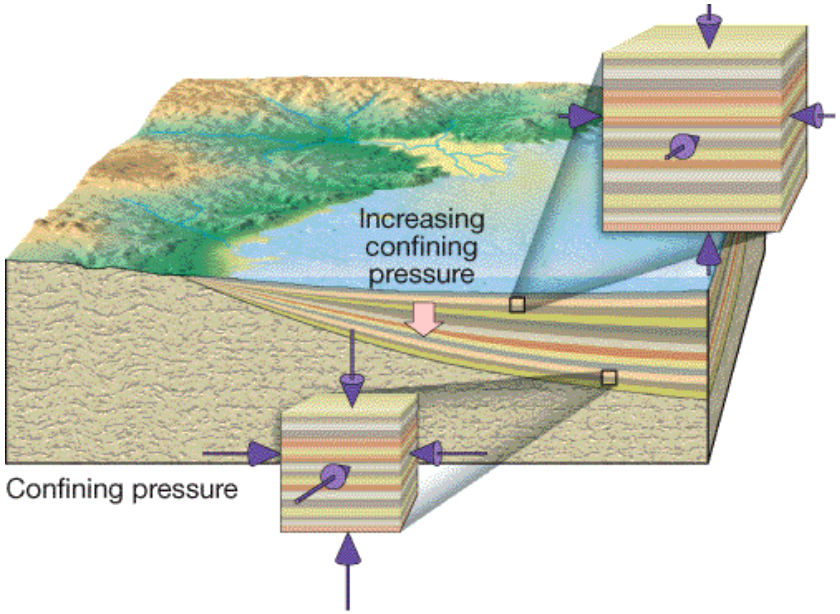
- Conditions for formation are found below the Earth’s surface.

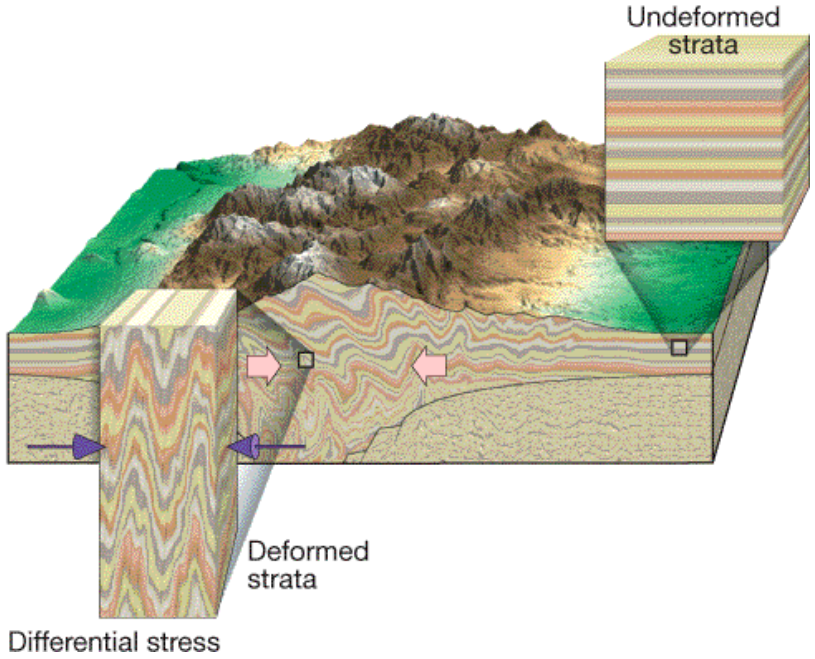
3.4 Agents of Metamorphism

- Heat
  - Provides the energy needed to drive chemical reactions

- Pressure
  - Causes a more compact rock with greater density

Origin of Pressure in Metamorphism





3.4 Classification of Metamorphic Rocks

- Two main categories

1. **Foliated Metamorphic Rock**
   - Has a banded or layered appearance

2. **Nonfoliated Metamorphic Rock**
   - Does not have a banded texture

Gneiss Typically Displays a Banded Appearance

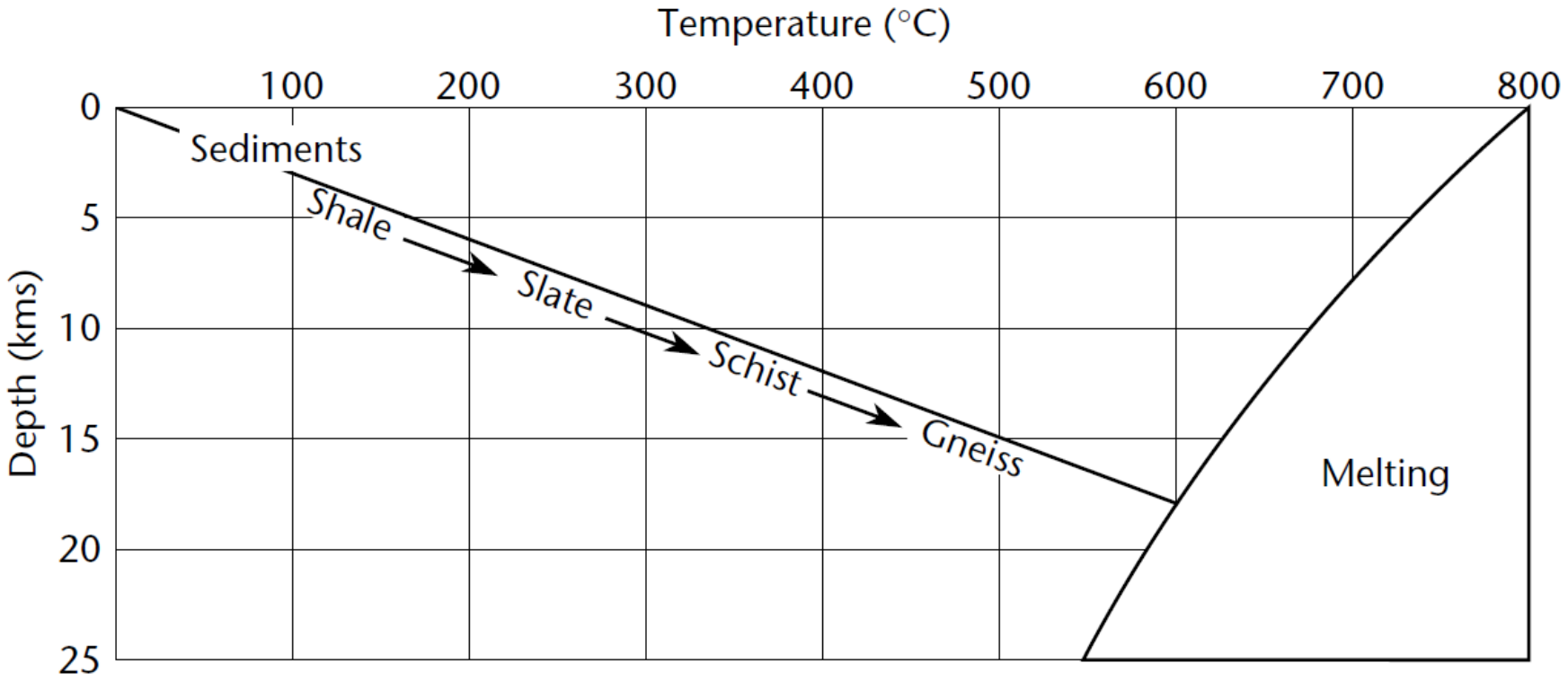
Marble—A Nonfoliated Metamorphic Rock

1) What is the relationship between rock temperature and depth beneath the surface?

Temperature increases with depth.

Metamorphic Process

Use the graph to answer questions about the formation of metamorphic rocks.

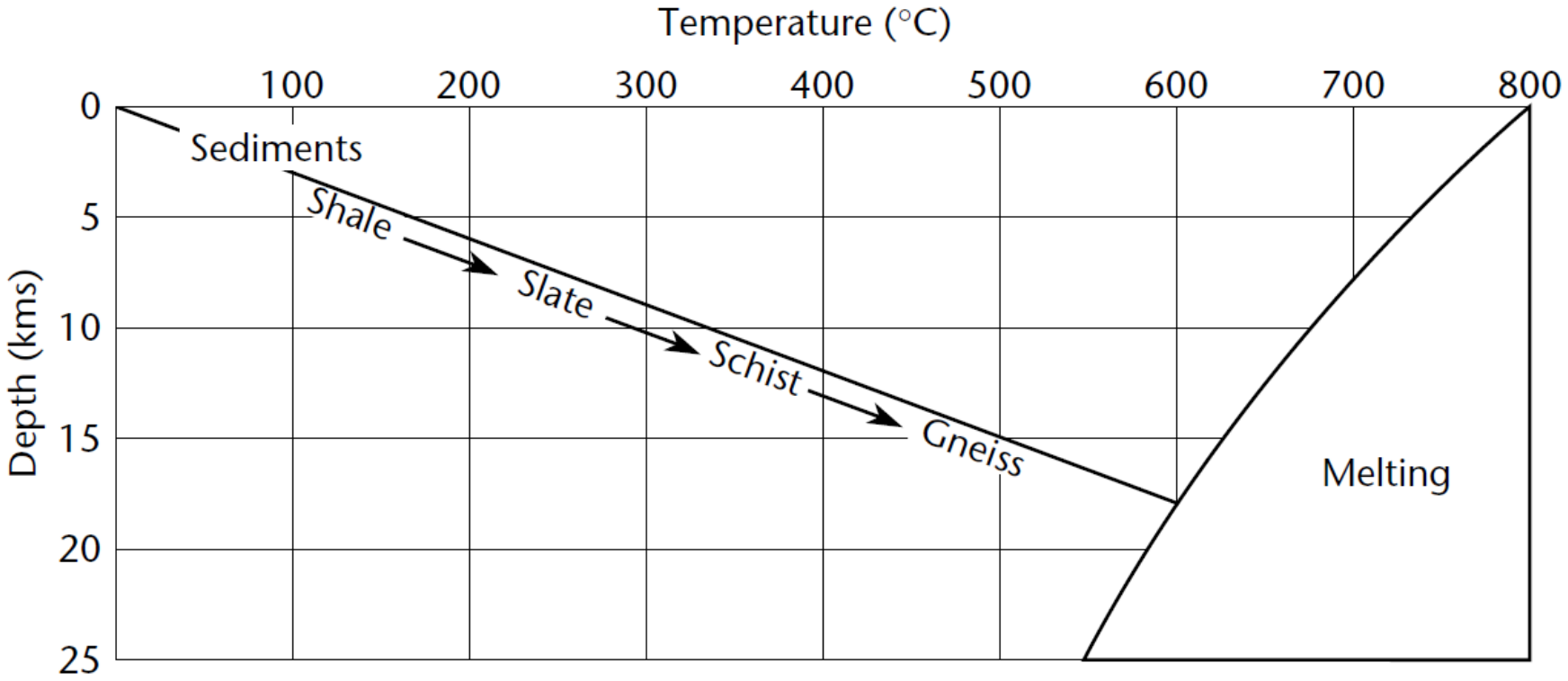


2) At the depth of 10 km, what would the temperature be?

About 325 ˚C

Metamorphic Process

Use the graph to answer questions about the formation of metamorphic rocks.

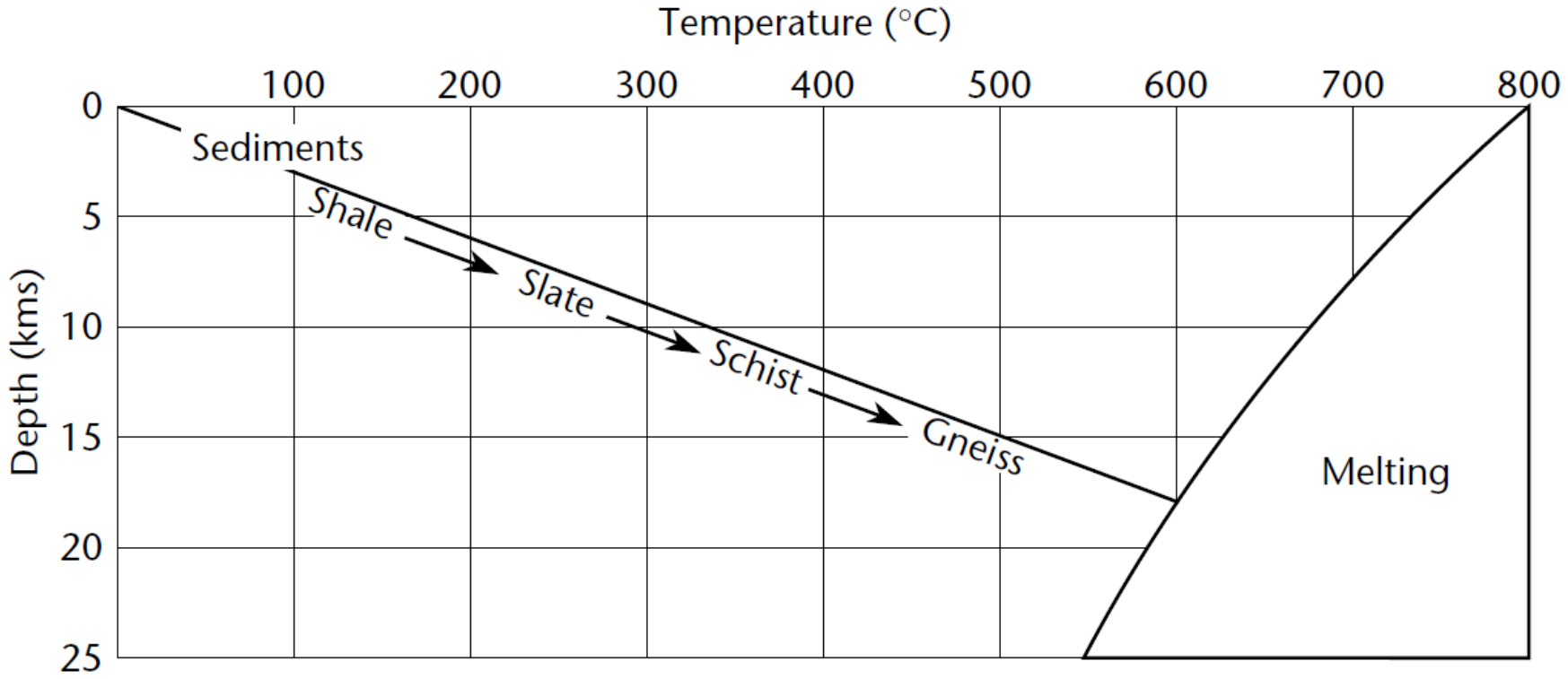


3) Between 0 an 10 km, how many degrees per km. does the temperature increase?

325 – 0 = 325 ˚C ***10 – 0 = 10 km*** ***325 / 10 = 32.5 ˚C/ Km***

Metamorphic Process

Use the graph to answer questions about the formation of metamorphic rocks.

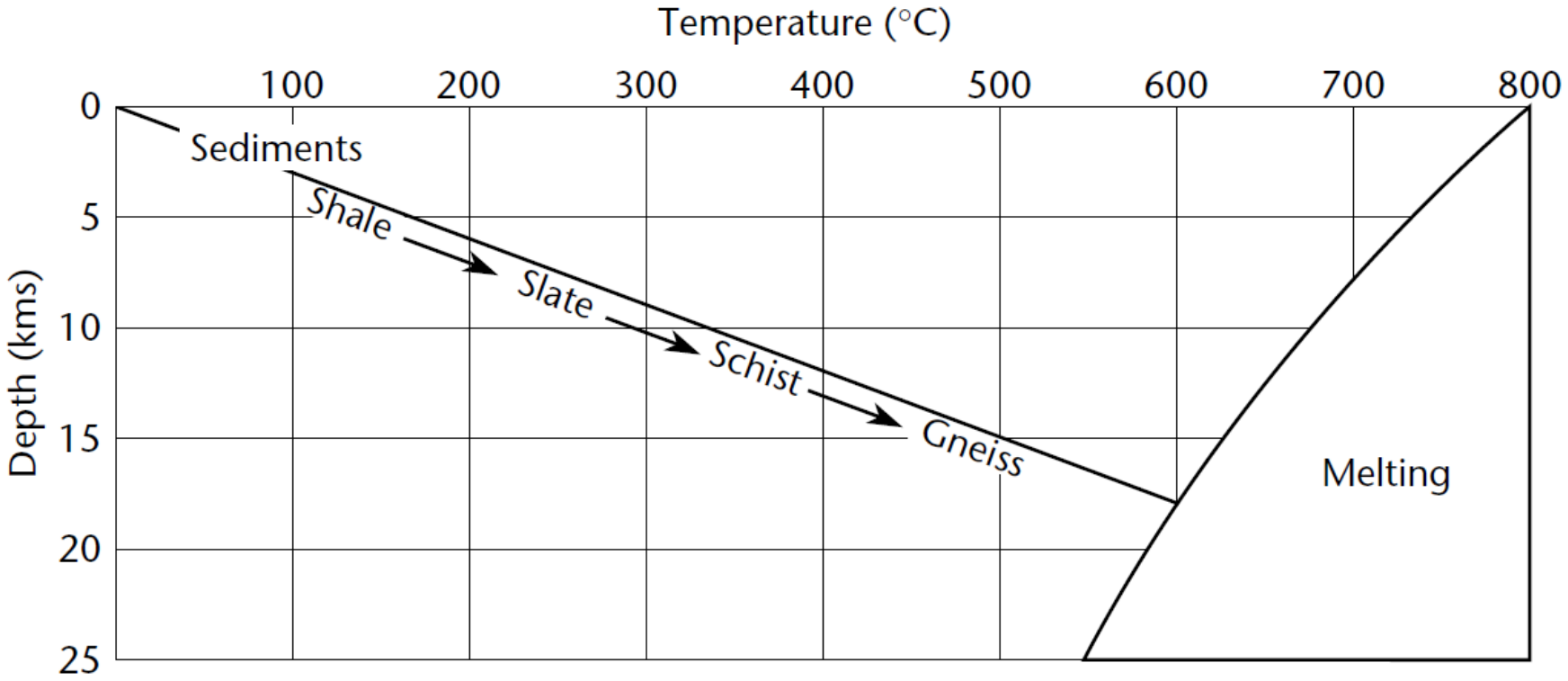


4) Which metamorphic rock shown forms at the highest temperature?

Gneiss

Metamorphic Process

Use the graph to answer questions about the formation of metamorphic rocks.

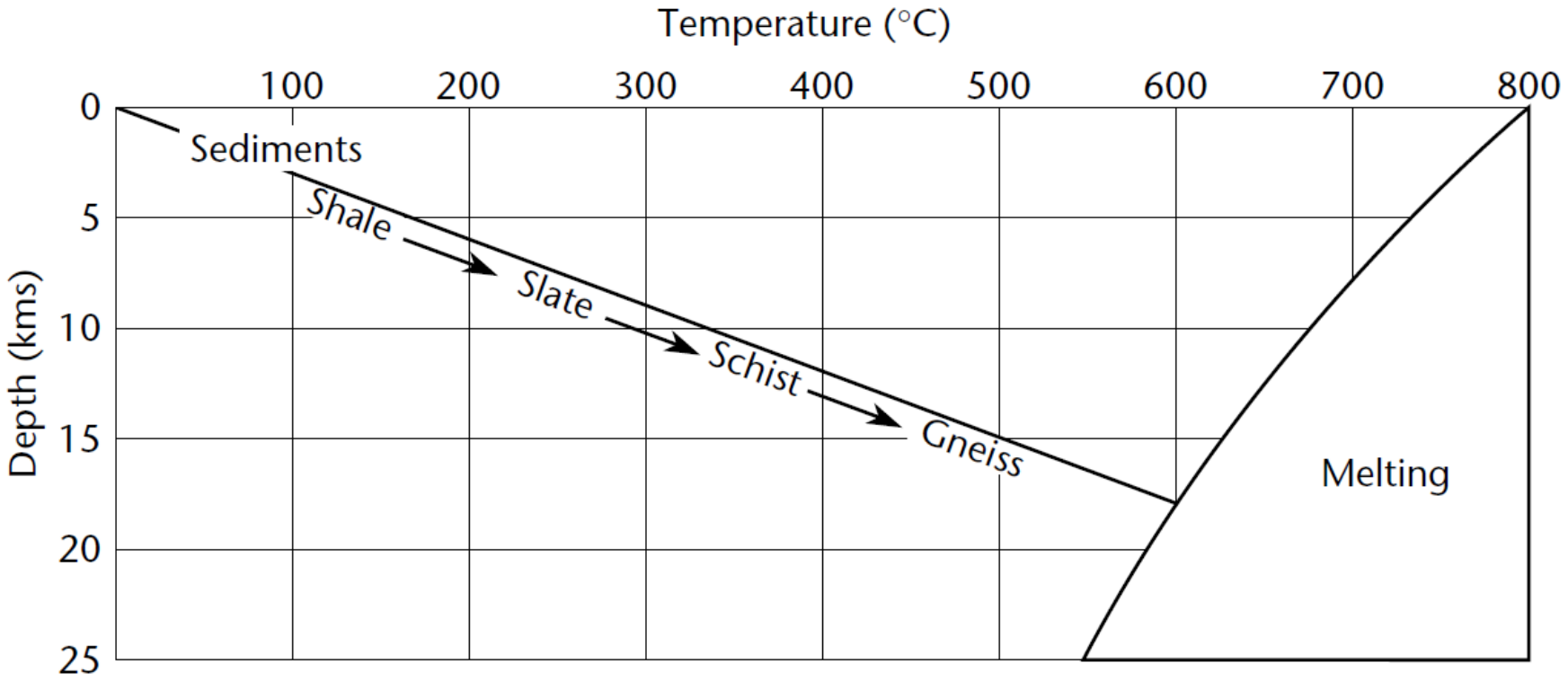


5) Through what general temperature range would you expect schist to form?

300 ˚C – 400 ˚C

Metamorphic Process

Use the graph to answer questions about the formation of metamorphic rocks.

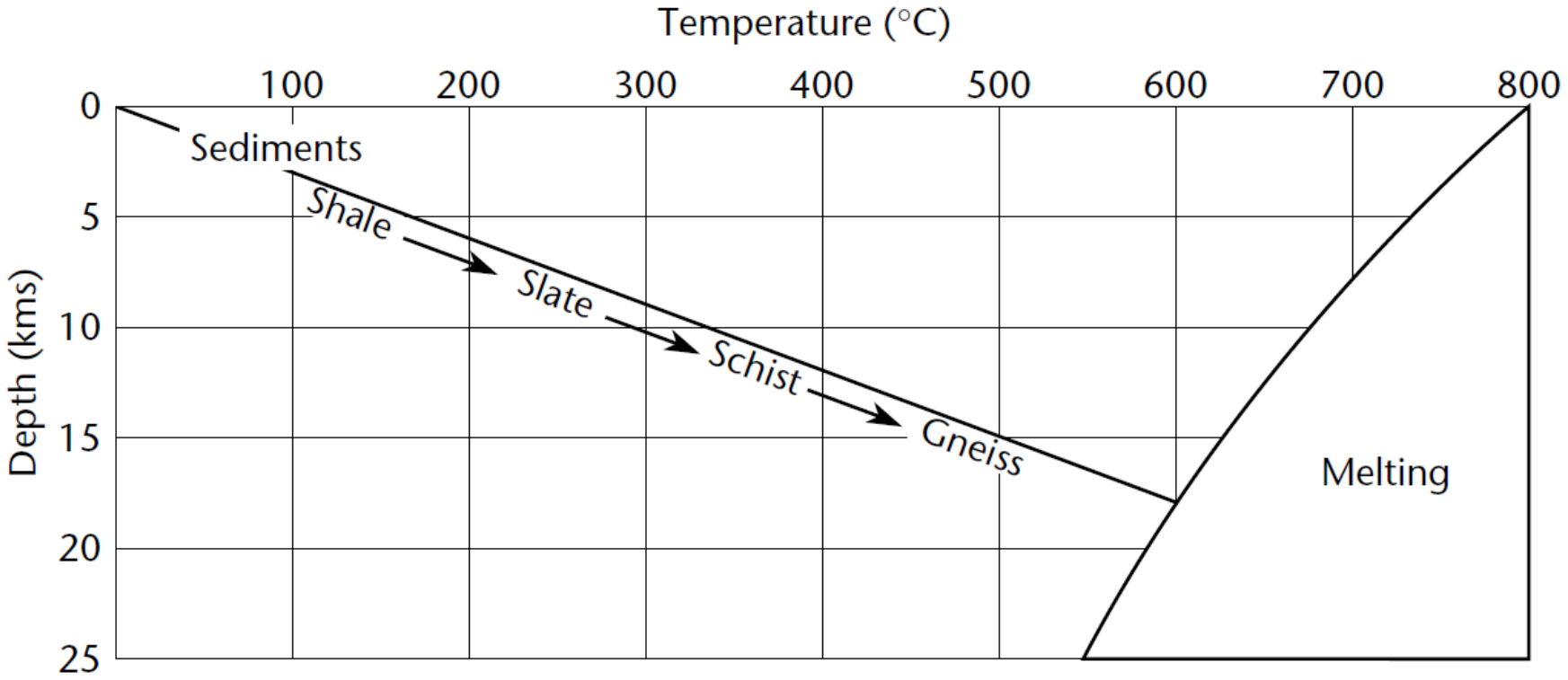


6) How many Km beneath the surface does gneiss occur?

14 – 17 km

Metamorphic Process

Use the graph to answer questions about the formation of metamorphic rocks.

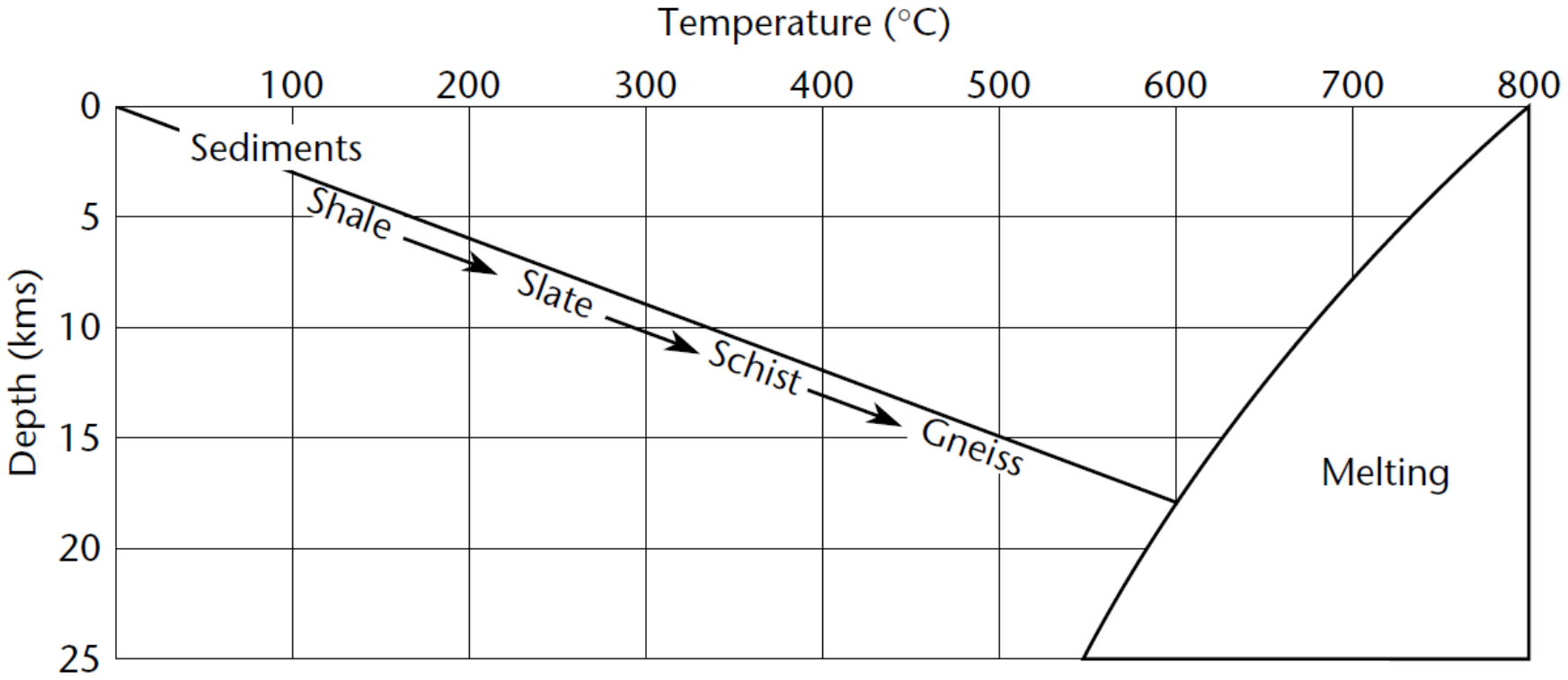


7) As the depth increases, what happens to the temperature at which rocks melt?

Melting temperature decreases

Metamorphic Process

Use the graph to answer questions about the formation of metamorphic rocks.

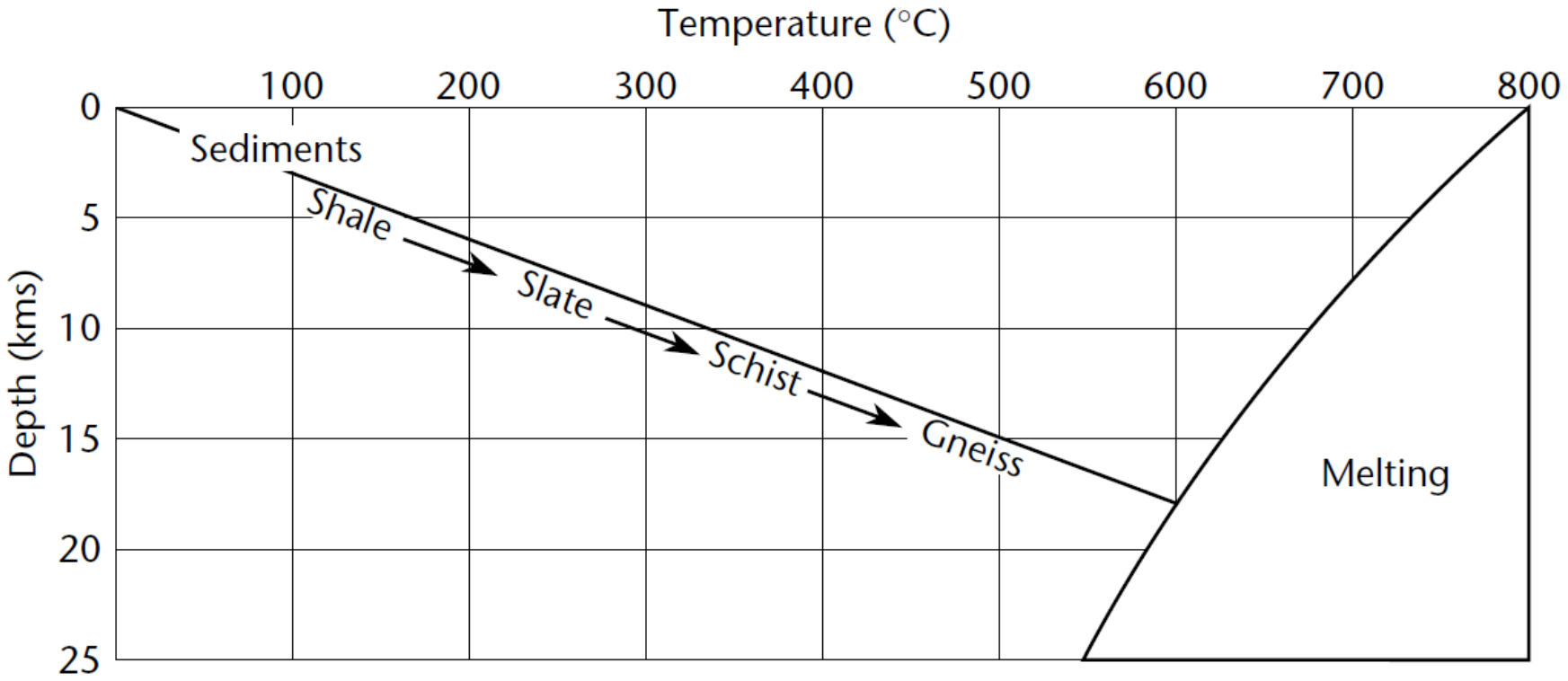


8) Suppose you knew that a certain metamorphic rock begins to form at about 300˚C. How many km beneath the surface might this rock temperature occur?

8 km

Metamorphic Process

Use the graph to answer questions about the formation of metamorphic rocks.

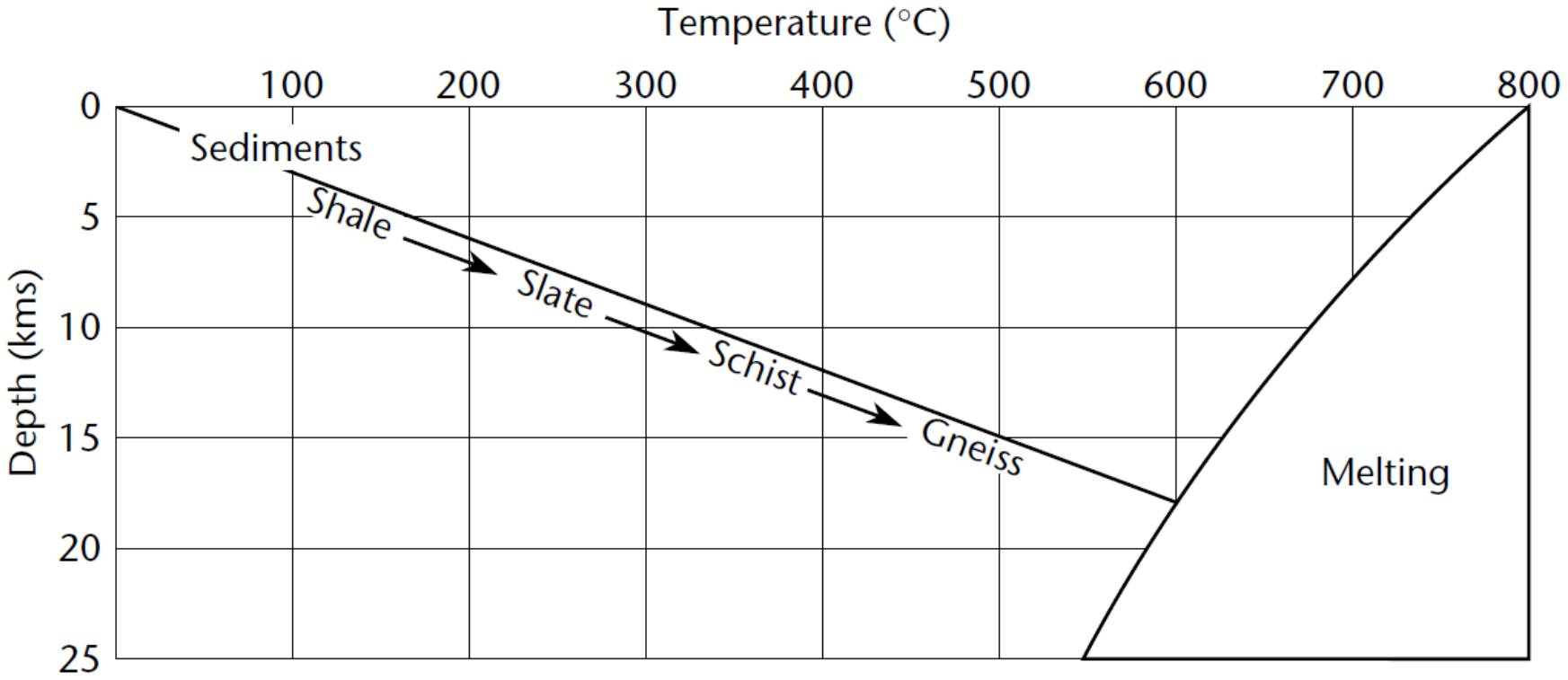


9) How far beneath the surface does shale metamorphose to slate?

6 – 8 km

Metamorphic Process

Use the graph to answer questions about the formation of metamorphic rocks.



10) Metasomatism is described as a process by which metamorphic rocks may gradually change into granite (an igneous rock). At which temperature does metasomatism begin?

About 600 °C

Metamorphic Process

Use the graph to answer questions about the formation of metamorphic rocks.