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Checkups and follow-ups

CHAPTER 6 ANSWER KEY

ST
Questions 1–10, 12–16, 20–33, A, C and D

The lithosphere and the hydrosphere

Checkup

1 THE LITHOSPHERE (pp. 184–200)

1. Look at the illustration opposite.

a) Name the different layers of the Earth's structure.

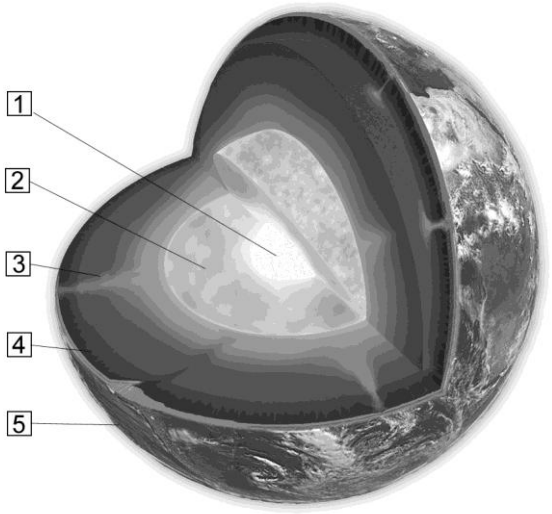
1 *Inner core*

2 *Outer core*

3 *Lower mantle*

4 *Upper mantle*

5 *Earth's crust*



b) Which layers form the lithosphere?

The Earth's crust and the topmost part of the upper mantle

2. What distinguishes a mineral from a rock?

Minerals are solid inorganic substances with clearly defined composition and properties. Rocks are heterogeneous solids composed of many minerals. Their physical and chemical properties are not strictly defined.

3. What am I? A rock, a mineral or both?

a) I am crystalline in nature. *Mineral*

b) I am neither animal nor vegetable in origin. *Mineral*

c) I am a solid substance. *Mineral and rock*

d) I am a mixture. *Rock*

e) I am found in the lithosphere. *Mineral and rock*

f) I always have the same chemical composition. *Mineral*

g) I am a product of cooled lava. *Rock*

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4. True or false? Explain your answer.

a) Light passes straight through crystal. It is a translucent mineral.

False. It is a transparent mineral.

b) Gold is always yellow. It is an idiochromatic mineral.

True. Idiochromatic minerals are always the same colour.

c) Amethyst has a hardness of seven on the Mohs scale. It is harder than topaz.

False. It is not as hard as topaz.

5. At first glance, pyrite looks very much like gold. What tests could you conduct to try and distinguish one mineral from the other?

I could test their hardness or rub them on a surface of unglazed porcelain to see the colour of the powder trace (streak) they leave.

6. What can be compared using the Mohs scale?

The hardness of minerals

7. A teacher takes an enormous rock from her garden and shatters it into small pieces. She gives each of her students a piece, and they must analyze its hardness, colour and streak. Will all the students obtain different results? Explain your answer.

The students obtain different results because rocks are heterogeneous masses of minerals.

8. Which type of rock is it (igneous, sedimentary or metamorphic)?

a) Sandstone is formed by the accumulation and compaction of layers of sand.

Sedimentary rock

b) Slate is formed from sedimentary rock subjected to heavy pressure.

Metamorphic rock

c) Granite results from the cooling of magma.

Igneous rock

9. The Raglan Mine in northern Québec produces nickel. What can this mineral be used for?

Answers will vary. Examples: stainless steel manufacture, coins and magnets.

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10. A building contractor wants to build a high-rise apartment building with a five-level underground parking lot. Before beginning construction, he must remove the layers of soil covering the rock. Name the layers of soil (in order) that the contractor must remove.

Organic matter, topsoil and subsoil

⇒ **Question 11 is not intended for students in the ST program.**

12. In the Canadian Arctic, houses are sinking into the ground, and runways are cracking. Explain your answer.

The upper layer of permafrost thaws in summer, threatening the stability of buildings with foundations in this layer of frozen ground.

13. Is there any vegetation in the Far North of Québec? Explain your answer.

Answers will vary. Example: No, because the ground is permanently frozen.

14. Vicky, who lives in the village of Kuujjuaq in northern Québec, wants to build a house on piles.

a) Given that the active layer in her region is 1.5 m thick, how long should the piles be? Explain your answer.

The piles she installs must be more than 1.5 m long so that they sit directly on the permafrost.

b) Can Vicky be sure of the long-term stability of her house?

Answers will vary. Example: No, because the thickness of the active layer is in danger of increasing due to global warming, which means that the piles will no longer sit on a solid foundation.

15. Name three fuels that come directly from the lithosphere.

Coal, natural gas and oil

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16. Name the form of energy described in each statement.

a) It is produced by atomic fission.

Nuclear energy

b) It is the result of the decomposition of prehistoric plants and animals.

Fossil energy

c) It is derived from the internal heat of the Earth.

Geothermal energy

d) It emits more greenhouse gases than any other form of energy.

Fossil energy

e) It leaves behind radioactive waste.

Nuclear energy

f) It is in danger of running out within the next few decades.

Fossil energy

⇒ **Questions 17 to 19 are not intended for students in the ST program.**

2 THE HYDROSPHERE (pp. 200–213)

20. What am I? I represent 2.5 percent of the hydrosphere, and 79 percent of my total volume is contained in glaciers.

Fresh water

21. Name five forms of water in the hydrosphere.

Answers will vary. Examples: oceans, seas, rivers, lakes, groundwater, clouds, glaciers and pack ice.

22. Environmental experts divide inland waters among watersheds. How do they define the boundaries of watersheds?

By identifying their natural boundaries, formed by the crests of nearby mountains, hills or other high ground

23. Name four factors that affect the flow of water within a watershed.

Answers will vary. Examples: topography, geology, climate, vegetation, and agricultural, industrial and urban development.

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24. The differences in seasonal temperatures are not as great in the ocean as on land.

a) Explain your anwer.

In the winter, the ocean loses some of the heat it stored during the summer. Because water loses heat more slowly than the ground, the differences in seasonal temperatures are less pronounced at sea than on land.

b) Name three factors that affect the temperature of ocean waters.

Answers will vary. Examples: the seasons, latitude and depth.

25. Is seawater more saline at the poles or in the tropics? Explain your answer.

Seawater is more saline in the tropics because heat and drought accelerate evaporation and concentrate the salts in the water. Near the poles, on the other hand, melting ice and glaciers dilute seawater and reduce its salt content.

26. What am I?

a) I am a wind-driven ocean current.

A surface current

b) I am an ocean current caused by differences in water density.

A subsurface current

c) I form a huge "conveyor belt" that transports ocean waters around the world.

Thermohaline circulation

27. Name three factors that affect ocean circulation.

Winds, water salinity and water temperature

28. Which water is denser?

a) water with three-percent salinity or water with four-percent salinity?

Water with four-percent salinity

b) water at 12°C or water at 18°C?

Water at 12°C

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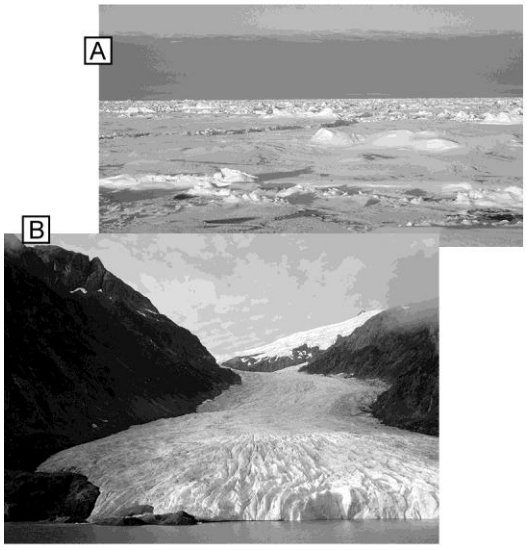
29. What is the cryosphere?

The portion of frozen water on the Earth's surface

30. The two photos opposite were taken during a trip to the Arctic.



a) Which photo features pack ice?

Photo A

b) What distinguishes the glacier from the pack ice?

A glacier is a mass of ice on land, formed by compressed snow, while pack ice consists of the ice floating on the oceans near the North and South poles.

31. What impact can melting pack ice have on the environment?

Melting pack ice threatens the survival of species that depend on the ice, such as polar bears or ringed seals.

32. Name two consequences of melting ice in the Greenland and Antarctic ice sheets.

Thawing ice sheets make the rock underneath the glaciers slippery, so they slide more quickly toward the ocean. The ice that falls into the ocean raises the sea level—a cause of concern among populations in many countries. Thawing ice sheets also release abnormally high amounts of fresh water into the Norwegian Sea, where it mixes with the Gulf Stream. The seawater becomes less dense and does not sink as readily, which could slow the ocean currents and affect the climate in many regions.

33. Name one advantage of hydroelectric power.

Answers will vary. Examples: It depends on a renewable resource. – It generates very little greenhouse gas.

⇒ **Questions 34 to 36 are not intended for students in the ST program.**

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REVIEW QUESTIONS

⇒ **Question B is not intended for students in the ST program.**

A. A prospecting company has discovered a new gold deposit in Québec, in a belt of volcanic rock. The company must extract the volcanic rock from the ground to recover the gold fragments and shape them into ingots.

a) What is the rock containing the gold fragments called?

Ore

b) This rock is the result of volcanic activity. What type of rock is it?

Igneous rock

c) To confirm that the prospectors have really found gold, geologists perform various tests. Name three of them.

Answers will vary. Examples: transparency, hardness and streak.

d) The gold lies deep underground. What type of mine should be built?

An underground mine

C. Cruise ships regularly offer tours along the shores of Greenland. Tourists can observe the spectacular blocks of ice that break off from the coast and fall into the sea.

a) What are these blocks of ice called?

Icebergs

b) A few fragments of ice melt in the seawater. This water does not stay near the coast; it moves about. What factors will affect its movement?

The salinity and temperature of the water

c) Will the meltwater eventually arrive at the equator? Explain your answer.

Because of thermohaline circulation

d) In certain places, the Greenland glaciers are melting at twice their previous rate. Which climatic phenomenon explains this acceleration?

Global warming

D. Prepare your own summary of Chapter 6 by building a concept map.

See the Concept maps *section in Guide B.*

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Follow-up

1. The Inuit diet consists mainly of food that the people have hunted or fished and food that has been brought in from southern regions. How does climate change interfere with their diet?

Answers will vary. Examples:

– Traditional ice roads are melting, so hunting and fishing grounds are becoming hard to reach in winter.

– Pack ice is disappearing, which makes it difficult to hunt seals and polar bears. Ice fishing also becomes hazardous.

– Runways are damaged by thawing permafrost, which complicates the delivery of supplies from the south.

2. Although Inuit are responsible for a tiny fraction of global greenhouse gas emissions, they are more profoundly affected by climate change than any other population. How can people living farther south demonstrate solidarity with their northern neighbours?

Answers will vary. Examples:

– by reducing their greenhouse gas emissions

– by adopting active modes of transport (walking, biking, etc.) or public transit

– by demanding that governments adopt legislation forcing industries to reduce their emissions

– by demanding that governments promote less polluting energies such as wind power.