Package Title: Testbank

Course Title: Visualizing Geology, 4e

Chapter Number: 01

Question Type: Multiple Choice

01) The branch of geology that deals with understanding the processes which operate at or beneath the surface of Earth and the materials on which those processes act is called \_\_\_\_\_.

a) historical geology

b) physical geology

c) economic geology

d) structural geology

Answer: B

Difficulty: Easy

Learning Objective: Explain how geologists use the scientific method.

Section Reference: What is Geology?

02) Which branch of geology is concerned with the formation, occurrence, and search for valuable mineral deposits?

a) historical geology

b) physical geology

c) economic geology

d) structural geology

Answer: C

Difficulty: Easy

Learning Objective: Explain how geologists use the scientific method.

Section Reference: What is Geology?

3) The study of how rocks deform (break and bend) is referred to as \_\_\_\_\_.

a) historical geology

b) physical geology

c) economic geology

d) structural geology

Answer: D

Difficulty: Easy

Learning Objective: Explain how geologists use the scientific method.

Section Reference: What is Geology?

04) Which one of the following is a system?

a) a leaf

b) a tree

c) a mountain range

d) All of these are examples of systems

Answer: D

Difficulty: Easy

Learning Objective: Explain what is meant by a systems approach to geology.

Section Reference: What is Geology?

05) Which one of the following is a good example of a closed system?

a) a lake

b) a volcano

c) a tree

d) None of these are examples of a closed system.

Answer: D

Difficulty: Medium

Learning Objective: Explain what is meant by a systems approach to geology.

Section Reference: What is Geology?

06) Earth is a close approximation of a (an) system.

a) open

b) closed

c) isolated

d) restricted

Answer: B

Difficulty: Easy

Learning Objective: Explain what is meant by a systems approach to geology.

Section Reference: What is Geology?

07 ) Movements and interactions in the lithosphere and the internal Earth processes that drive them are referred to as the \_\_\_\_\_ cycle.

a) rock

b) hydrologic

c) metamorphic

d) tectonic

Answer: D

Difficulty: Easy

Learning Objective: Explain how Earth’s major subsystems interact, using the concept of cycles.

Section Reference: What is Geology?

08) The set of crustal processes that form new rock, modify it transport it, and break it down is known as the \_\_\_\_ cycle.

a) rock

b) hydrologic

c) metamorphic

d) tectonic

Answer: A

Difficulty: Easy

Learning Objective: Explain how Earth’s major subsystems interact, using the concept of cycles.

Section Reference: What is Geology?

09) The model that describes the movement of water through the reservoirs of the Earth System is called the \_\_\_\_\_ cycle.

a) rock

b) hydrologic

c) metamorphic

d) tectonic

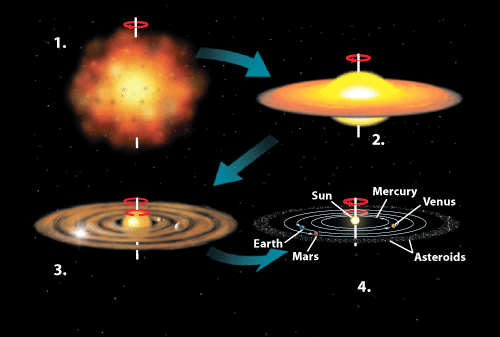
Answer: B

Difficulty: Easy

Learning Objective: Explain how Earth’s major subsystems interact using the concept of cycles.

Section Reference: What is Geology?

10) The figure below depicts the evolution of the solar system. During which stage would the process of nuclear fusion begin?



a) Stage 1

b) Stage 2

c) Stage 3

d) Stage 4

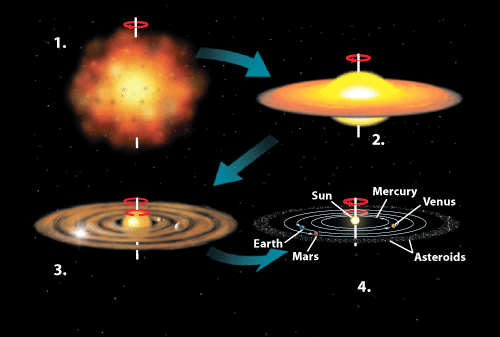
Answer: C

Difficulty: Medium

Learning Objective: Describe how planetary accretion, meteorite impacts, and chemical differentiation have shaped the Solar System.

Section Reference: Earth in Space

11) The figure below depicts the evolution of the solar system. During which stage would there be the onset of significant accretion?



a) Stage 1

b) Stage 2

c) Stage 3

d) Stage 4

Answer: C

Difficulty: Medium

Learning Objective: Describe how planetary accretion, meteorite impacts, and chemical differentiation have shaped the Solar System.

Section Reference: Earth in Space

12) The fusion of hydrogen atoms in the Sun and the formation of Earth and other planetary bodies through the processes of condensation and accretion was essentially complete \_\_\_\_\_ years ago.

a) 456 million

b) 4.56 million

c) 4.56 billion

d) 45.6 billion

Answer: C

Difficulty: Medium

Learning Objective: Describe how planetary accretion, meteorite impacts, and chemical differentiation have shaped the Solar System.

Section Reference: Earth in Space

13) The cloud of gas and dust from which the moons and planets of our solar system eventually formed is called the \_\_\_\_\_.

a) solar nebula

b) condensation cloud

c) nuclear cloud

d) accretionary nebula

Answer: A

Difficulty: Medium

Learning Objective: Describe how planetary accretion, meteorite impacts, and chemical differentiation have shaped the Solar System.

Section Reference: Earth in Space

14) The early planets of the solar system formed as gravity caused larger debris to attract smaller chunks, thereby growing larger through the process of \_\_\_\_\_.

a) accretion

b) volcanism.

c) metamorphism

d) gravitational collapse

Answer: A

Difficulty: Easy

Learning Objective: Describe how planetary accretion, meteorite impacts, and chemical differentiation have shaped the Solar System.

Section Reference: Earth in Space

15) The term planetary differentiation refers to the process in which \_\_\_\_\_.

a) lithospheric plates move around on the underlying asthenosphere in the terrestrial planets

b) Earth separated into concentric layers or zones that differ in composition.

c) the planets of our solar system condensed and accreted

d) Earth originated

Answer: B

Difficulty: Easy

Learning Objective: Describe how planetary accretion, meteorite impacts, and chemical differentiation have shaped the Solar System.

Section Reference: Earth in Space

16) Which one of the following Earth materials is not part of the regolith?

a) muds in river valleys

b) sands in deserts

c) soil

d) rock fragments from meteorite impacts

e) All of the above are part of Earth's regolith

Answer: E

Difficulty: Easy

Learning Objective: Identify several similarities and differences among Earth and the other inner planets.

Section Reference: Earth in Space

17) Differentiation of the inner planets probably means that each of the rocky planetary bodies \_\_\_\_\_.

a) started out with a cold exterior that was heated by the sun.

b) lost temperature early in its history.

c) went through a period with thick atmospheres.

d) started out hot enough to melt, either partially or completely.

Answer: D

Difficulty: Easy

Learning Objective: Identify several similarities and differences among Earth and the other inner planets.

Section Reference: Earth in Space

18) Which of the inner planets has an atmosphere containing mostly carbon dioxide and has an average surface temperature of 480° Celsius?

a) Mercury

b) Venus

c) Earth

d) Mars

Answer: B

Difficulty: Easy

Learning Objective: Identify several similarities and differences among Earth and the other inner planets Section Reference: Earth in Space

19) Which of the inner planets has an atmosphere containing mostly nitrogen and has an average urface temperature of 14.6° Celsius?

a) Mercury

b) Venus

c) Earth

d) Mars

Answer: C

Difficulty: Easy

Learning Objective: Identify several similarities and differences among Earth and the other inner planets.

Section Reference: Earth in Space

20) Which of the inner planets has an atmosphere too thin to retain much heat and has an average surface temperature of -63° Celsius?

a) Mercury

b) Venus

c) Earth

d) Mars

Answer: D

Difficulty: Easy

Learning Objective: Identify several similarities and differences among Earth and the other inner planets.

Section Reference: Earth in Space

21) Which of the inner planets has a regolith that is largely the product of weathering?

a) Mercury

b) Venus

c) Earth

d) Mars

Answer: C

Difficulty: Easy

Learning Objective: Identify several similarities and differences among Earth and the other inner planets. Section Reference: Earth in Space

22) Of the other inner planets of the solar system, Earth's size is most similar to \_\_\_\_\_.

a) Mercury

b) Venus

c) Mars

Answer: B

Difficulty: Easy

Learning Objective: Identify several similarities and differences among Earth and the other inner planets.

Section Reference: Earth in Space

23) The “plates” in Earth's plate tectonics are made of fragments of \_\_\_\_\_.

a) continents

b) the lithosphere

c) oceanic crust

d) the mantle

Answer: B

Difficulty: Easy

Learning Objective: Identify several similarities and differences among Earth and the other inner planets. Section Reference: Earth in Space

24) The Principle of Uniformitarianism tells us that \_\_\_\_\_.

a) Earth is extremely old

b) Earth systems don't change over geologic time because material is continually being cycled around; the amounts taken away balance the amounts added

c) the present is the key to the past

d) All of the above are true

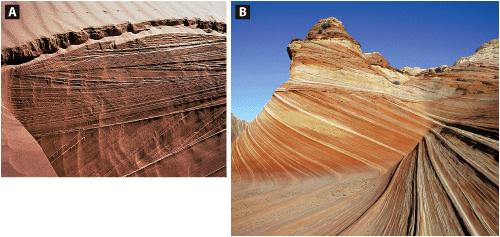
Answer: C

Difficulty: Easy

Learning Objective: Explain Hutton’s principle of uniformitarianism.

Section Reference: The Ever-Changing Earth

25) In the two photographs below, A shows structures within a modern sand dune that are identical to the structures in the sandstone shown in B. Geologists interpret the structures in the ancient sandstone to be formed by the same processes as those that produced the structures in the modern sand dune. A geologist’s ability to interpret these structures by comparing them to modern processes is an example of .



a) paleontology.

b) the nebular hypothesis.

C) uniformitarianism.

D) a systems approach.

Answer: C

Difficulty: Easy

Learning Objective: Explain Hutton’s principle of uniformitarianism.

Section Reference: The Ever-Changing Earth

26) The Principle of Uniformitarianism is based on the premise that \_\_\_\_\_.

a) processes that governed Earth's system were completely different in the past to the processes that we see today.

b) the same processes that operated on Earth in the past are similar to the processes that operate today.

c) processes governing Earth were more violent in the past than they are today.

d) All of the above are true.

Answer: B

Difficulty: Medium

Learning Objective: Explain Hutton’s principle of uniformitarianism.

Section Reference: The Ever-Changing Earth

27) Throughout Earth’s history, though the processes that occur on Earth have not changed, the \_\_\_\_\_.

a) temperature and composition of the atmosphere has been dramatically different in the past.

b) level of the oceans has fluctuated.

c) location of the continents has varied over time.

d) All of the above are true.

Answer: D

Difficulty: Easy

Learning Objective: Explain Hutton’s principle of uniformitarianism.

Section Reference: The Ever-Changing Earth

28) The study of geology is important to human society because \_\_\_\_\_.

a) Earth materials and processes affect our lives through our dependence on Earth resources

b) of a need to understand geologic hazards such as volcanic eruptions, floods and earthquakes

c) it is important to understand the physical properties of the natural environment

d) All of the above are important reasons to study geology.

Answer: D

Difficulty: Easy

Learning Objective: Explain Hutton’s principle of uniformitarianism.

Section Reference: The Ever-Changing Earth

**Question Type: True/False**

29) Physical geology can use historical geology as a tool to understand processes that formed rocks in the past.

Answer: True

Difficulty: Easy

Learning Objective: Explain how geologists use the scientific method.

Section Reference: What is Geology?

30) An open system can exchange both matter and energy across its boundaries.

Answer: True

Difficulty: Easy

Learning Objective: Explain what is meant by a systems approach to geology.

Section Reference: What is Geology?

31) Earth is a fairly close approximation of a closed system.

Answer: True

Difficulty: Easy

Learning Objective: Explain what is meant by a systems approach to geology.

Section Reference: What is Geology?

32) The hydrosphere comprises all of Earth's water and ice, both on the surface and underground.

Answer: True

Difficulty: Easy

Learning Objective: Explain how Earth’s major subsystems interact, using the concept of cycles.

Section Reference: What is Geology?

33) The tectonic cycle refers to the set of crustal processes that form new rock, modify it, transport it, and break it down.

Answer: False

Difficulty: Easy

Learning Objective: Explain how Earth’s major subsystems interact, using the concept of cycles.

Section Reference: What is Geology?

34) The nebular hypothesis proposes that the solar system coalesced out of a swirling cloud of interstellar dust and gas.

Answer: True

Difficulty: Easy

Learning Objective: Describe how planetary accretion, meteorite impacts, and chemical differentiation have shaped the solar system.

Section Reference: Earth in Space

35) Earth is the only terrestrial planet we know of that contains water and ice.

Answer: False

Difficulty: Easy

Learning Objective: Identify several similarities and differences among Earth and the other inner planets,

Section Reference: Earth in Space

36) Continental crust is thicker and less dense than oceanic crust.

Answer: True

Difficulty: Easy

Learning Objective: Identify several similarities and differences among Earth and the other inner planets. .

Section Reference: Earth in Space

37) Hutton's Principle of Uniformitarianism states that the physical processes on Earth have not changed over time.

Answer: True

Difficulty: Easy

Learning Objective: Explain Hutton’s principle of uniformitarianism.

Section Reference: The Ever-Changing Earth

38) Activity on Earth's surface has erased all traces of ancient meteorite impacts, such as those still visible on the moon.

Answer: False

Difficulty: Easy

Learning Objective: Explain Hutton’s principle of uniformitarianism.

Section Reference: The Ever-Changing Earth

**Question Type: Fill-In-The-Blank**

39) \_\_\_\_\_\_ geology focuses on how materials and processes in the natural geologic environment affect, and are affected by, human activities.

Answer: Environmental

Difficulty: Easy

Learning Objective: Explain how geologists use the scientific method. .

Section Reference: What is Geology?

40) A system is one that does not allow matter to pass through its boundaries, but may allow energy to do so.

Answer: closed

Difficulty: Easy

Learning Objective: Explain how geologists use the scientific method.

Section Reference: What is Geology?

41) Earth’s four very large subsystems are the geosphere, hydrosphere, atmosphere, and \_\_\_\_\_\_.

Answer: biosphere

Difficulty: Easy

Learning Objective: Explain how Earth’s major subsystems interact, using the concept of cycles.

Section Reference: What is Geology?

42) The \_\_\_\_\_\_ cycle circulates water through various reservoirs of the Earth system: the ocean, the atmosphere, the geosphere, and the biosphere.

Answer: hydrologic

Difficulty: Easy

Learning Objective: Explain how Earth’s major subsystems interact, using the concept of systems.

Section Reference: What is Geology?

43) The \_\_\_\_\_\_ cycle describes the set of crustal processes that form new rock, modify it, transport it, and break it down.

Answer: rock

Difficulty: Easy

Learning Objective: Explain how Earth’s major subsystems interact, using the concept of cycles.

Section Reference: What is Geology?

44) The \_\_\_\_\_\_ cycle describes the movements and interactions in the geosphere and the internal Earth processes that drive them.

Answer: tectonic

Difficulty: Easy

Learning Objective: Explain how Earth’s major subsystems interact, using the concept of cycles.

Section Reference: What is Geology?

45) The \_\_\_\_\_\_ hypothesis states that our solar system coalesced from a swirling cloud of interstellar dust and gas.

Answer: nebular

Difficulty: Easy

Learning Objective: Describe how planetary accretion, meteorite impacts, and chemical differentiation have shaped the solar system.

Section Reference: Earth in Space

46) The growth process in which bits of solid matter gradually gathered together to form the planets is called \_\_\_\_\_\_.

Answer: accretion

Difficulty: Easy

Learning Objective: Describe how planetary accretion, meteorite impacts, and chemical differentiation have shaped the solar system.

Section Reference: Earth in Space

47) \_\_\_\_\_ geology is concerned with the formation, occurrence, and search for valuable mineral deposits.

Answer: Economic

Difficulty: Easy

Learning Objective: Explain how geologists use the scientific method.

Section Reference: What is Geology?

48) \_\_\_\_\_\_is the process by which the terrestrial planets separated into concentric layers of differing chemical composition.

Answer: Differentiation

Difficulty: Easy

Learning Objective: Describe how planetary accretion, meteorite impacts, and chemical differentiation have shaped the solar system.

Section Reference: Earth in Space

49) The term \_\_\_\_\_\_ refers to the chemical alteration and mechanical breakdown of rock caused by exposure to water, air, and living organisms.

Answer: weathering

Difficulty: Easy

Learning Objective: Describe how planetary accretion, meteorite impacts, and chemical differentiation have shaped the solar system.

Section Reference: Earth in Space

50) The innermost planets of the solar system are also referred to as the \_\_\_\_\_\_ planets, because of their similarities to Earth.

Answer: terrestrial

Difficulty: Easy

Learning Objective: Describe how planetary accretion, meteorite impacts, and chemical differentiation have shaped the solar system.

Section Reference: Earth in Space

51) Since 2006, Pluto and Ceres have been classified as .

Answer: dwarf planets

Difficulty: Easy

Learning Objective: Distinguish between the rocky planets, the gaseous planets, and other nonplanetary objects in our solar system.

Section Reference: Earth in Space

52) The \_\_\_\_\_\_ forms the outermost compositional layer of solid Earth.

Answer: crust

Difficulty: Easy

Learning Objective: Describe how planetary accretion, meteorite impacts, and chemical differentiation have shaped the solar system.

Section Reference: Earth in Space

53) The middle compositional layer of Earth, the\_\_\_\_\_\_, lies between the core and the crust.

Answer: mantle

Difficulty: Easy

Learning Objective: Describe how planetary accretion, meteorite impacts, and chemical differentiation have shaped the solar system.

Section Reference: Earth in Space

54) The \_\_\_\_\_\_ is the innermost compositional layer of solid Earth.

Answer: core

Difficulty: Easy

Learning Objective: Describe how planetary accretion, meteorite impacts, and chemical differentiation have shaped the solar system.

Section Reference: Earth in Space

55) \_\_\_\_\_\_ is the older, thicker, and less dense part of Earth's crust that forms the majority of Earth's land masses.

Answer: Continental crust

Difficulty: Easy

Learning Objective: Describe how planetary accretion, meteorite impacts, and chemical differentiation have shaped the solar system.

Section Reference: Earth in Space

56) The concept of \_\_\_\_\_\_ holds that the processes which govern Earth’s systems today have operated in a similar manner throughout geologic time.

Answer: uniformitariansim

Difficulty: Easy

Learning Objective: Explain Hutton’s principle of uniformitarianism.

Section Reference: The Ever-Changing Earth

57) The physical processes that occur on Earth have not changed over time, but the physical conditions of Earth \_\_\_\_\_\_ (have changed/have not changed) dramatically.

Answer: have changed

Difficulty: Easy

Learning Objective: Explain Hutton’s principle of uniformitarianism.

Section Reference: The Ever-Changing Earth

58) The process of \_\_\_\_\_\_ describes the movement and interactions of large segments of Earth's lithosphere.

Answer: plate tectonics

Difficulty: Easy

Learning Objective: Describe how planetary accretion, meteorite impacts, and chemical differentiation have shaped the solar system.

Section Reference: Earth in Space

**Question Type: Essay**

59) What is the difference between physical geology and historical geology?

Answer: Physical geology is concerned with understanding the processes that operate beneath the surface of Earth and the materials on which those processes operate. Historical geology, on the other hand, is concerned with the sequence of geologic events that have occurred in the past.

Difficulty: Easy

Learning Objective: Describe some of the braches of geology.

Section Reference: What is Geology?

60) How does applying an Earth systems approach change the way the science of geology is conducted?

Answer: Traditionally, scientists have studied Earth by focusing on separate units—the atmosphere, the oceans, or a single mountain range. An Earth systems approach allows scientists to look at the connections between the various parts of Earth with a greater understanding of the complexities of the larger system.

Difficulty: Difficult

Learning Objective: Explain what is meant by a systems approach to geology.

Section Reference: What is Geology?

61) What is a closed system?

Answer: A closed system is a portion of the universe that can be separated for the purpose of study that has boundaries which allow energy, but not matter, to be exchanged with its surroundings.

Difficulty: Easy

Learning Objective: Explain what is meant by a systems approach to geology.

Section Reference: What is Geology?

62) What are the subsystems of Earth?

Answer: Earth’s systems can be divided into four very large subsystems, which are the principal reservoirs of materials and energy. These are the lithosphere, hydrosphere, atmosphere, and biosphere.

Difficulty: Medium

Learning Objective: Explain how Earth’s major subsystems interact, using the concept of cycles.

Section Reference: What is Geology?

63) What are the reservoirs of the hydrologic cycle?

Answer: The hydrologic cycle describes the movement of Earth's water between and through various reservoirs. The reservoirs of this cycle include the: oceans, lakes, streams, and other bodies of surface water, plus groundwater, glaciers and ice sheets. The biosphere and atmosphere also serve as pathways for water moving between reservoirs.

Difficulty: Difficult

Learning Objective: Explain how Earth’s major subsystems interact, using the concept of cycles.

Section Reference: What is Geology?

64) What is the tectonic cycle?

Answer: The tectonic cycle encompasses the movements and interactions of plates of lithosphere, and the internal Earth processes that drive them.

Difficulty: Medium

Learning Objective: Explain how Earth’s major subsystems interact, using the concept of cycles.

Section Reference: What is Geology?

65) What is the rock cycle?

Answer: The rock cycle is the set of crustal processes that form new rock, modify it, transport it, and break it down.

Difficulty: Easy

Learning Objective: Explain how Earth’s major subsystems interact, using the concept of cycles.

Section Reference: What is Geology?

66) In what ways do the biosphere and the lithosphere interact?

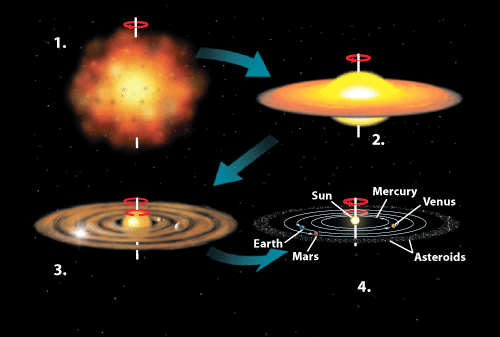
Answer: One important example has to do with plants. Plants draw nutrients from the lithosphere and redistribute (reprocess) them into the biosphere. When the plants die and decompose, some of the material they contain may enter the hydrosphere and atmosphere, while other parts may fossilize and re-enter the lithosphere.

Difficulty: Difficult

Learning Objective: Explain how Earth’s major subsystems interact, using the concept of cycles.

Section Reference: What is Geology?

67) The illustration below shows four stages in the development of the solar system. Describe the changes that take place in stage 2 of this evolution.



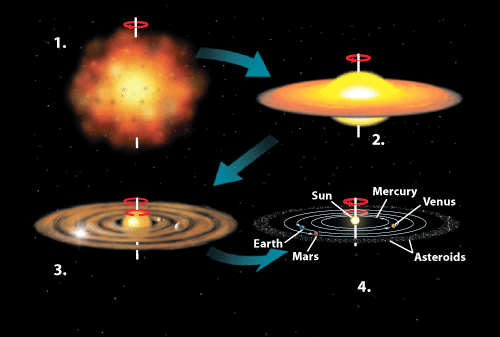
Answer: As the gas cloud contracts, it spins faster and faster, forming a central bulge and a wide disk.

Difficulty: Medium

Learning Objective: Describe how planetary accretion, meteorite impacts, and chemical differentiation have shaped our solar system.

Section Reference: Earth in Space

68) The illustration below shows four stages in the development of the solar system. Describe the changes that take place in stage 3 of this evolution.



Answer: Contraction raises the temperature. The process of nuclear fusion begins in the central bulge. The sun begins to shine. The outer disk cools, now containing a wide swath of rocky debris. Larger chunks of debris begin to attract smaller chunks by gravity, thereby growing larger (accretion).

Difficulty: Medium

Learning Objective: Describe how planetary accretion, meteorite impacts, and chemical differentiation have shaped our solar system.

Section Reference: Earth in Space

69) Given scientists' current understanding of the formation of the Moon, how might the composition of the Moon compare to that of the Earth?

Answer: According to our current understanding of the formation of the Moon, Earth and the Moon should have some chemical similarities and differences. Some 4.5 billion years ago, the still forming Earth was hit by another smaller but growing body, which scientists have named Theia. The impact caused part of Earth's mantle and Theia to be ejected into space. The material reconsolidated under the influence of gravity to form the Moon. It should, therefore, share many chemical characteristics of Earth's mantle, while also retaining some distinct differences contributed by Theia.

Difficulty: Difficult

Learning Objective: Identify several similarities and differences among Earth and the other inner planets. Section Reference: Earth in Space

70) Why are meteorites of such interest to scientists?

Answer: Most of today's meteoroids are the debris that never managed to be swept up by any planet. Occasionally, pieces of this debris fall to Earth as meteorites. As such, meteorites are fascinating relics of the early days of the solar system.

Difficulty: Easy

Learning Objective: Describe how planetary accretion, meteorite impacts, and chemical differentiation have shaped the solar system.

Section Reference: Earth in Space

71) Describe the compositional structure of Earth's interior, formed through the process of differentiation.

Answer: Earth differentiated into three layers: a relatively thin, low-density, rocky crust, a rocky, intermediate-density mantle, and a metallic, high-density core.

Difficulty: Easy

Learning Objective: Describe how planetary accretion, meteorite impacts, and chemical differentiation have shaped the solar system.

Section Reference: Earth in Space

72) Volcanism is common to the histories of all of the terrestrial planets. What type of volcanic rock is common to all of the terrestrial planets?

Answer: The volcanic rock basalt is common to all of the terrestrial planets.

Difficulty: Easy

Learning Objective: Identify several similarities and differences among Earth and the other inner planets.

Section Reference: Earth in Space

73) Earth is not the only terrestrial planet with regolith. What makes Earth's regolith different from the regolith on other planets?

Answer: Earth's regolith is unique because it is formed by complex physical, chemical, and biological processes, usually involving water. Earth's regolith is also unique because it is teeming with life. In contrast, the regolith of other planets and satellites is lifeless and has formed primarily from the relentless pounding of meteorite impacts.

Difficulty: Medium

Learning Objective: Identify several similarities and differences among Earth and the other inner planets.

Section Reference: Earth in Space

74) How do Venus and Earth differ?

Answer: Earth and Venus are very close in size, but differ greatly in other respects. There is no liquid water or ice on Venus, whereas Earth has water vapor, liquid water, and ice. The surface temperature on Venus (480 ºC) is excessively hot compared to that of Earth (14.6ºC).

Difficulty: Medium

Learning Objective: Identify several similarities and differences among Earth and the other inner planets.

Section Reference: Earth in Space

75) How do Mars and Earth differ?

Answer: Mars is a smaller and less massive planet than Earth. Also, Mars lacks liquid water on its surface, though ice may exist beneath the regolith. Mars also has a very thin atmosphere. The surface temperatures on Mars are quite low (-63ºC) compared to those on Earth (14.6ºC).

Difficulty: Medium

Learning Objective: Identify several similarities and differences among Earth and the other inner planets.

Section Reference: Earth in Space

76) At the end of the Cretaceous period, an asteroid hit Earth and may have led to the extinction of many species, including the dinosaurs. How do you reconcile this event with Hutton's concept of uniformatarianism?

Answer: Uniformitarianism states that the processes that occur on Earth have not changed over time. The rates of different processes have changed over time, and though asteroid impact may be the most dramatic, there are many other examples.

Difficulty: Medium

Learning Objective: Explain Hutton’s principle of uniformitarianism.

Section Reference: The Ever-Changing Earth

77) Impact craters cover the surface of large parts of other terrestrial bodies in the solar system, such as Mars and the Moon. Why don't we see many covering Earth's surface?

Answer: Earth's surface was bombarded, as were all of the inner planets, by rocky, metallic, and icy debris early in its history. Impact craters record this early accretionary period. Earth's dynamic processes – reflected in the tectonic, hydrologic, and rock cycles – have acted to erase this early history of bombardment.

Difficulty: Easy

Learning Objective: Identify several similarities and differences among Earth and the other inner planets. Section Reference: Earth in Space

78) Why is the study of geology important to human society?

Answer: The study of geology is important to human society for many reasons. Earth materials and processes affect our lives through our dependence on Earth resources, our need to understand geologic hazards, and our need to understand the physical environment in which we live.

Difficulty: Easy

Learning Objective1: Explain how geologists use the scientific method.

Section Reference: What is Geology?

79) Urban geographers have applied the systems concept to the study of cities. Explain why this is useful approach. Can you think of another example in which a systems approach might be useful in studying a human system, or the impact of human activities on a natural system?

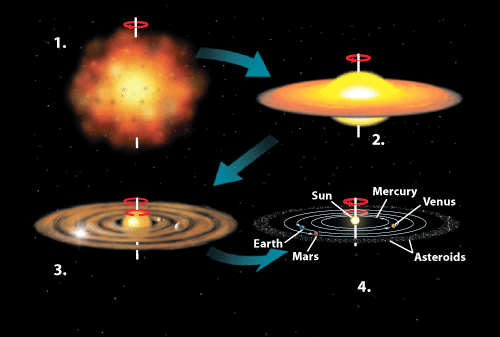
Answer: A systems approach to urban planning is useful because of the complexity of cities. A systems approach is a helpful way to break down a large, complex problem into smaller pieces that are easier to study without losing sight of the connections between those pieces. The systems approach has proved useful in a number of studies of both artificial and natural systems. This approach could also be extended to studying a number of human systems, or the impact of human activities on natural systems. There are many examples of possible studies that could be undertaken. One important example, currently being studied by scientists all over the world, is the potential impact of anthropogenic carbon dioxide on the climate system. Climate is so complex that it is a perfect candidate for study using a systems approach.

Difficulty: Difficult

Learning Objective: What is meant by a systems approach to geology?

Section Reference: What is Geology?

80) The figure below shows the four stages of the development of the solar system. Summarize each of these stages.



Answer: The figure below illustrates the four stages of the evolution of the solar system. In the first stage a cloud of matter begins to contract under the influence of gravity; as the cloud contracts, it begins to rotate. As the cloud contracts further, the rotation continues, becoming faster with time. Eventually, the cloud flattens to a disk with a central bulge at the center of its axis of rotation. This contraction raises temperature, nuclear fusion begins in the middle of the central bulge, and the proto-sun begins to shine. During this stage, the outer disk cools and now contains a swath of rocky debris. Larger chunks of debris begin to attract smaller fragments by gravity, thereby beginning the process of accretion. Accretion continues into the fourth stage by which time almost all the debris has accreted into today's planets.

Difficulty: Medium

Learning Objective: Describe how planetary accretion, meteorite impacts, and chemical differentiation have shaped the solar system.

Section Reference: Earth in Space

81) Explain why the inner planets are rocky, while the outer planets of the solar system contain higher proportions of gas and ice.

Answer: The nebular theory explains very well why the inner planets are rocky, while the outer planets contain a higher proportion of ice and gas. The temperature was higher in the portion of the nebula that was to become the innermost part of the solar system. Elements with a high melting point (like iron, silicon, etc. – the chemicals that make up rock) would have condensed early-on to form the cloud. Meanwhile, a strong solar wind stripped much of the lighter gases, such as helium and hydrogen, from the inner planets. But the solar wind was not strong enough to do the same to the outer planets, which grew into gas giants. Volatile compounds, such as water and methane, condense only at lower temperatures. Therefore water ice, methane ice, and other ices are abundant on the moons and smaller bodies of the outer solar system, where the primordial nebula was cooler.

Difficulty: Medium

Learning Objective: Distinguish between the rocky planets, the gaseous planets, and other important nonplanetary objects in our solar system.

Section Reference: Earth in Space