

Chapter 1 - Introduction to Earth Science**Topic 1**

_____ **Science** - the study of Earth, its oceans, atmosphere, and the universe

While there are _____ primary branches of Earth science, the systems they study are interconnected. There is frequent overlap between branches and there are numerous specialties within each branch

_____ - an occurrence that causes change (i.e. earthquakes, volcanoes, tornadoes, meteorites,)

Topics 2

_____ - study of the origin, history, & structure of the Earth (minerals & rocks, earthquakes, volcanoes, ...)

Topic 3

_____ - Study of the universe beyond Earth (stars, planets, comets, ..., using tools such as telescopes, satellites, and space probes -- *Mariner, Pioneer, Viking, Voyager, ...*)

Topic 4

meteorology - study of the Earth's _____ (weather, climate, air pollution, solar energy, ...), which extends hundreds of km above the Earth's surface

_____ – long-term weather patterns for a specific area

Topic 5

_____ – study of the world's ocean (ocean floor, ocean currents, movement of icebergs,, ...)

Topic 6

_____ **system** - the sun and its family of planets, moons (natural satellites) asteroids, meteoroids, and comets
Six facts about our solar system:

1. all _____ move around the sun (revolve) in the same direction
2. The paths, or orbits, of the planets around the sun are all nearly _____
3. most of the _____ are in nearly the same flat surface (plane)
4. the sun turns on its axis (rotates) in almost the same plane as the planets and in the same direction that the planets _____
5. most of the planets _____ (turn on axis) in the same direction as the sun
6. ~~seven~~ six of the ~~nine~~ eight planets have _____; most of the moons _____ around the planets in the same direction that the planets revolve around the sun

_____ - informed guess that tries to explain how/why an event occurs; a good hypothesis explains known facts

Topic 7

_____ **hypothesis** - great clouds of gas & dust, rotating in space, gradually transformed into planets & satellites

protoplanets - compact masses that became _____ and _____

Topic 8

Three sources of heat as Earth formed: _____, _____ minerals, _____ by meteorites

Model of events leading to the formation of the _____:

1. protoplanet earth lacked oceans and atmosphere
2. heat caused elements to melt
3. dense materials such as iron sank
4. materials formed layers
5. steam and gases escaped to the surface during volcanic eruptions
6. steam condensed into water that accumulated as oceans

Topic 9

Earth's _____ today: 78% free _____; 21% free _____ -- (free means not combined with other elements); 1% other _____ such as argon, carbon dioxide, helium, water vapor, ...)

Earth's original atmosphere is thought to be similar to _____ eruptions -- 50% water vapor, large amounts of _____ and sulfur, but no free _____

Original source of _____ -- breakup of water molecules by sunlight in the upper atmosphere

_____ - process by which green plants manufacture sugars and starches from carbon dioxide and water in the presence of sunlight; excess oxygen is released into the atmosphere as free oxygen

Topic 10

_____ - representation (picture, diorama, formula, description, simulation,...) that shows a concept, event, or object that cannot be seen in its natural state.

Three primary layers:

_____ - thin outer layer of relatively light rock; 10 km below oceans - 65 km below continents

_____ - layer of heavy rock; 2900 km thick

_____ - layer of iron and nickel; _____ outer core is 2250 km thick; _____ inner core is a sphere 1200 km in diameter

Earth's _____ formed as Earth's temperature increased, melting iron and _____ in the rock; the dense liquid mineral sank toward the Earth's center; the lighter rock material was forced upward to form the Earth's _____

Topic 11

The continents are thought to have formed either from light rock that was forced to Earth's surface or by great lava flows from erupting _____

Over the years the _____ have undergone many changes

Chapter 2 - Earth's Shape, Dimensions, and Internal Heat

Topic 1

Evidence that the Earth was spherical -

- 1) the mast of ships appearing/disappearing over the _____; 2) changes in the _____ sky;
- 3) during _____ of the moon, earth's shadow casts an arc

_____ of Earth from space now reveal its spherical form

_____ - a round object whose surface is at all points equidistant from the center; like a round ball

Topic 2

_____ - a sphere that's flattened at its poles and bulges at its equator

_____ evidence based on weight - the _____ of an object (in Newton's) is the force with which gravity pulls an object toward Earth's center; weight changes with distance from the center; a given object is almost the same everywhere on Earth's surface

_____ evidence based on weight - the weight of an object is not exactly the same all over Earth; an object weighs slightly _____ at the equator than at the poles; the earth is an _____ spheroid

Topic 3

The first scientific estimate of Earth's circumference was probably made by the Greek astronomer _____

_____ took the distance between Syene and Alexandria, calculated what part of the whole circumference this was (based on the difference in the shadows created by the sun's rays at a given time), and multiplied the measured distance by the parts needed to make the whole circle.

_____ - the distance around a circle

Topic 4

Circumference at Equator..... 40, 074 km
 Diameter at Equator..... 12, 756 km

Circumference at Poles 40, 007 km
 Diameter at Poles..... 12, 714 km

~ circumference..... _____ km ~ radius..... _____ km

Percentages of Earth's surface area
 _____ 71%;

_____ 29%

Eratosthenes Method:

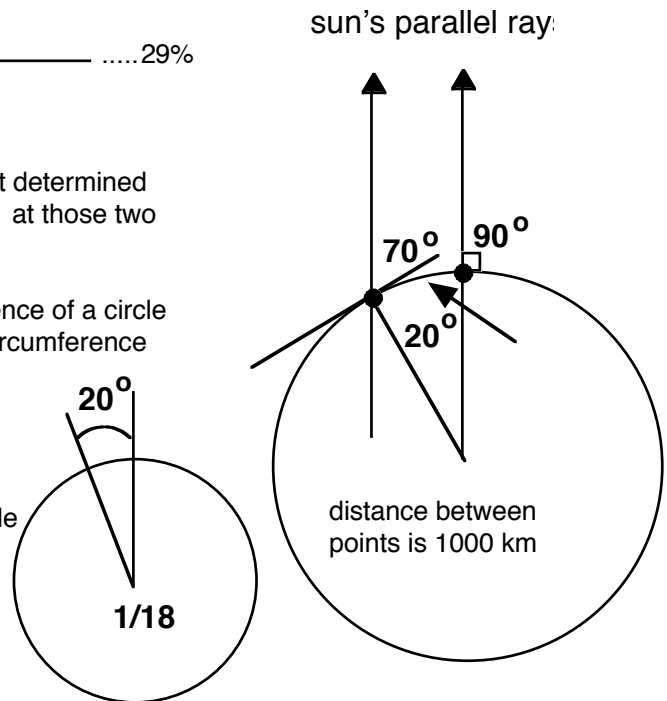
Multiply the distance between two points on a circle by an amount determined by comparing the angle at which the sun's rays strike the surface at those two points.

In the diagram, the angle formed by two points on the circumference of a circle and the center the circle is _____ °, then the fraction of the circumference between those two points is $20^\circ/360^\circ =$ _____.

Finally, multiply the distance between the two points by 18 to determine the circumference:

$1000 \text{ km} \times 18 =$ _____ km

360 degrees in a circle
 $20^\circ / 360^\circ = 1/18$



Topic 5

Density = measure of the amount of material in a given space

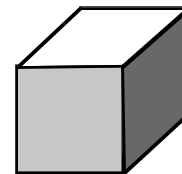
_____ = mass/volume (g/cm³)

Earth's average density = 5.5 g/cm³

Earth's crustal density = 2.8 g/cm³

Materials inside Earth must have densities greater than 5.5 g/cm³

Iron and nickel have densities of ~ 8.0 g/cm³



Volume = length x width x height

Topic 6

_____energy can warm the Earth's surface to a depth of approximately _____ meters. At that depth, underground caves maintain a temperature equal to the _____ yearly temperature for that location

Below 20 meters, temperature in the ground begins to rise at an average rate of _____ degree Celsius for every _____ meters in depth -- some variations may occur.

This rise in temperature becomes more gradual somewhere below the first few thousand meters of Earth's crust. The inner core is probably no hotter that _____degrees C.

Topic 7

Most heat in the Earth's rocks appears to come from _____ elements (uranium, ...). Other possible sources of heat include _____ between rock masses and heat left over from the _____ heat of the Earth's interior.

Heat loss from the Earth's interior is uneven: some rocks _____ heat more quickly than others; the _____ of the rock crust varies; the % of _____ elements is not the same in all rocks

Vocabulary:

astronomy, atmosphere, climate, circumference, crust, density, event, geology, gravity, hypothesis, inner core, iron, mantle, mass, meteorology, nickel, oblate spheroid, oceanography, outer core, photosynthesis, protoplanet, radioactive, solar, sphere, weight