

HONORS EARTH SCIENCE STUDY GUIDE FOR 2007 1ST SEMESTER EXAM

Nature of Science

1. Be able to distinguish between a good and a poor experimental design. To do this, review how to formulate a hypothesis; identify variables and controls; collect, organize and analyze data; and write, present and evaluate conclusions. P728-731
 - A. Write the definitions of hypothesis: a tentative explanation that is tested to determine if it is valid, variable: anything in an experiment that can change (Manipulated or independent variable is the one scientists purposely change. The responding or dependent variable is being observed by the scientists to see if it changes as a result of changes to the manipulated variable. Controlled variables are factors the scientists purposely keep the same. This helps to insure the reliability of the experiment.), data table: is a means of recording and reporting changes to the independent variable and responding changes to the dependent variable, conclusion: is a summary statement which confirms or refutes the hypothesis.
 - B. Design an experiment and have a classmate review the design.
2. When analyzing data, take time to look at the variables and units. (Hint: If necessary, draw a picture to help see what is happening.)
3. Be able to identify ways in which science and technology affect society.
4. Be able to identify and describe ethical practices that scientists use to inform and protect people and property from harm.

Weather

5. In which atmospheric layer does weather occur? p. 480- troposphere
6. What is temperature? p. 483 Temperature is a measure of the average kinetic energy of the individual atoms or molecules in a substance.
7. Explain how heat and temperature are related. p. 483 Heat is the energy transferred from one object to another because of a difference in their temperatures.
8. Describe the three methods of heat transfer- radiation, conduction, convection. p. 483-485

Name of Heat Transfer	Description	Example	More info
conduction	transfer of heat through matter by molecular activity	the metal handle of a spoon in a pot of boiling water.	heat flows from high to low
convection	transfer of heat by mass movement or circulation within a substance.	air currents around a candle	it takes place in a fluid (liquids/gases)
radiation	travels out in all directions from its source.	sunlight	unlike conduction and convection, radiation can travel through a vacuum.

9. Describe convection currents in a **Florida** living room during the **summer**. (Hint: think of the temperature-controlling appliance used mainly in Florida during the summer and

where its vents are located.) Temperature-controlling appliances mainly used in Florida are air conditioners. Air conditioning vents are located in the ceilings. Since cold fluids will fall due to density, the colder air is moved down throughout the room.

10. Describe convection currents in a **Maine** living room during the **winter**. (Hint: think of the temperature-controlling appliance used mainly in Maine during the winter and where its vents are located.) Temperature-controlling appliances mainly used in Maine are heaters. Heater vents and radiators are located close to the floor. Since warm air will rise due to density, the warmer air is moved throughout the room.

11. Compare and contrast the heating of land and water. p. 489 "Land heats more rapidly and to higher temperatures than water. Land also cools more rapidly and to lower temperatures than water."

12. Identify the gas most important for understanding atmospheric processes. p. 504 water vapor

13. Describe what happens during a change of state. p. 505-6 The process of changing state requires that energy is transferred in the form of heat.

State change	Name of Process	Heat absorbed or released
Solid to liquid	Melting	Heat absorbed
Liquid to gas	Evaporation	Heat absorbed
Gas to liquid	Condensation	Heat released
Liquid to solid	Freezing	Heat released
Gas to solid	Deposition	Heat released
Solid to gas	Sublimation	Heat absorbed

14. Compare and contrast the abilities of cold air and warm air to hold water vapor. p 506 "When saturated, warm air contains more water vapor than saturated cold air."

15. Describe what happens to air when it is compressed or allowed to expand. p. 510 "When air is allowed to expand, it cools, and when it is compressed, it warms."

16. List four mechanisms that cause air to rise. p 512-513 Orographic lifting, frontal wedging, convergence, localized convective lifting

17. With each pair of words, circle the one term that describes what air usually does as it moves from the ground up into the atmosphere.

- | | |
|-------------------------|----------------------|
| A. expands | contracts |
| B. cools down | heats up |
| C. becomes more dense | becomes less dense |
| D. exerts more pressure | exerts less pressure |

18. Describe the conditions in air that favor condensation of water.

p 516 *air must be saturated *air needs to be cooled *there is a surface for water to condense on, *presence of a particulate to act as a condensation nucleus

19. Know the following terms and how they apply to the formation of clouds- evaporation, condensation, condensation nuclei, precipitation, Bergeon process, supercooled, supersaturated, collision-coalescence process. p 520-521

20. Compare and contrast clouds and fogs. p 520 "Fog is defined as a cloud with its base at or very near the ground."

21. Explain what must happen for precipitation to form.

22. Identify what controls the type of precipitation that reaches Earth's surface. p 522
 "The type of precipitation that reaches Earth's surface depends on the temperature profile in the lowest few kilometers of the atmosphere."
23. What causes most of the winds on Earth? (P 534 "Wind is the result of horizontal differences in air pressure. Air flows from areas of higher pressure to areas of lower pressure.")
24. Explain how winds blow around pressure centers in the Northern and Southern Hemispheres. p 535 clockwise in the Northern Hemisphere and counterclockwise in the Southern Hemisphere.
25. Explain how the unequal heating of Earth's surface affects the atmosphere. p 540 "The cause of winds is the unequal heating of Earth's surface. In tropical regions, more solar radiation is received than is radiated back to space. In regions near the poles the opposite is true. The atmosphere balances these differences by acting as a giant heat-transfer system. This system moves warm air toward high latitudes and cool air toward the equator."
26. Draw and label land and sea breezes. See diagram p 543
27. Describe El Nino. p 546
28. Describe how El Nino impacts the weather around the globe. p. 546
29. True or false During an El Nino, there are fewer hurricanes in Florida. true El Nino changes the upper atmospheric wind patterns resulting in the shearing of the tops of clouds in our area. Therefore, the large clouds of hurricanes can not form.
30. True or false During an El Nino, there are more severe tornadoes in December through February in Florida. true El Nino changes the upper atmospheric wind patterns causing air masses from hot, dry Mexico to hit the Gulf of Mexico. These air masses quickly soak up water from the gulf. Should an air mass come to Florida from the gulf at the same time that a cold, dry air mass is coming from the north, the conditions are perfect for severe thunderstorms and tornadoes.
31. Define air mass. p 559
32. Explain how air masses are classified. p 560
33. Explain the characteristic features of each air mass classification. p 561-563
34. Complete the following chart: p 565-567

The Four Types of Fronts

Name of Front	Draw front. Label air masses and use arrows to show directions of motion.	Draw and label clouds where frontal wedging occurs.	List weather associated with front.
Warm			
Cold			
Occluded			
Stationary			

35. Describe the formation of a thunderstorm. p. 572
36. Describe the conditions needed for a tornado to form. p. 573
37. Identify the conditions that must exist for a hurricane to form. p. 576
38. What are some of the relationships between lightning and thunder? p. 578

39. What lightning safety guidelines do people new to Florida need to know?

<http://www.weather.gov/os/brochures/owlie-lightning.pdf>

What To Do When There is Lightning

- Get into your home or a large building.
- Get inside a hard-topped car.
- If you are in a field, crouch on your knees and bend over. Don't lie down because wet ground can carry electricity.
- If you are in water, get out. Get away from the beach.

If You are Outside

- If outside, stay in the open, not under a tree or in a picnic shelter or shed. It's better to get wet than fried!
- Lightning hits the tallest object.
- Move away from anything made of metal like a framed backpack. Metal draws electricity.
- Get to the lowest point possible if you are on a hill or mountain.
- Get out of a boat and into a building.

40.

40. What do these instruments measure: anemometer, barometer, wind vane, thermometer? anemometer measures wind speed, barometer measures atmospheric pressure, wind vane shows wind direction, thermometer measures temperature.

41. How does a hurricane get its energy? p. 576 A hurricane's fuel is from the energy given off when huge quantities of water vapor condense.

42. When is hurricane season? Officially it is June 1-November 1. Every month of the year has had a hurricane sometime in the past.

Oceans

43. Describe the topography of the ocean floor and compare it to land. p. 396- The topography of the ocean floor is as diverse as that of continents. See diagram on 402. Know the terms continental margin, continental shelf, continental slope, continental rise, deep-ocean trenches (like valleys on land), abyssal plains (like plains on land), seamounts and guyots (like mountains and plateaus on land).

44. Identify and describe three major technologies used to study the ocean floor. p 398-400 Sonar transmits sound waves toward the ocean floor and are used to plot the surface of the ocean floor. Satellites measure the shape of the ocean surface. These measurements indicate what is below the water on the ocean floor. Submersibles are underwater crafts used to collect data from areas where humans could not normally go.

50. State the importance of upwelling. p 451 "Upwelling brings greater concentrations of dissolved nutrients, such as nitrates and phosphates, to the ocean surface. These nutrient-enriched waters from below promote the growth of microscopic plankton, which in turn support extensive populations of fish and other marine organisms."

51. Describe the formation of density currents. p 451- "An increase in sea-water density can be caused by a decrease in temperature or an increase in salinity."

52. Describe how ocean waves get their energy. p. 455-6. Ocean waves are energy traveling along the boundary between ocean and atmosphere. "Most ocean waves obtain their energy and motion from the wind."

53. State three factors that determine the characteristics of a wave. p 456 "The height, length, and period that are eventually achieved by a wave depend on three factors: (1) wind speed; (2)length of time the wind has blown; and (3)fetch."

54. Describe how energy moves through a wave. p 456-7. See the diagrams on 456 and 457. "Circular orbital motion allows energy to move forward through the water while the individual water particles that transmit the wave move around in a circle."

55. What **FORCE** produces tides? p. 458 Gravity "Ocean tides result from the gravitational attraction exerted upon Earth by the moon and, to a lesser extent, by the sun.")

56. Describe how El Nino impacts the ocean. (Hint: go back to page 547.)

57. Fill in the following chart:

Variables and Their Effects on Ocean Circulation

Variable	Influences on Ocean Circulation
Wind	generates surface currents p. 448
El Nino	
Coriolis Effect	Earth's rotation causes currents to deflect in a clockwise motion in the Northern Hemisphere and in a counterclockwise motion in the Southern Hemisphere. These motions are on the surface. p. 449
Currents	Move water
Salinity	Changes in salinity change the density of the water. These changes result in circulation of ocean water as the different densities of the water move around to stabilize. These density currents influence deep-ocean circulation. p 451-452
Temperature	Changes in temperature change the density of the water. These changes result in circulation of ocean water as the different densities of the water move around to stabilize. These density currents influence deep-ocean circulation. p 451-452

Plate Tectonics

58. Fill in the following table: (see diagrams p 261-264 for drawings)

Types of boundaries	Drawing with arrows showing plates' motions at boundary	Action at boundary (converging, diverging, transform)	Physical features found at boundaries	Examples of boundaries on planet
I. Convergent boundaries				
A. oceanic-oceanic		Converge	Volcanic island arcs	Aleutian Islands off of Alaska
B. oceanic-continental		Converge	Continental volcanic arc, trench	Cascade Range in Oregon and Washington
C. continental-continental		Converge	mountains	Himalayas

II. Divergent boundary		Diverge	Oceanic ridges, sea-floor spreading, continental rifts	Mid-Atlantic Ridge, East African Rift Valley
III. Transform boundary		transform	Fault lines, fracture zones	San Andreas Fault line in California

59. Explain how seafloor spreading and continental rifting cause formation of new lithosphere. p 259 As plates diverge, rising magma fills in and forms new lithosphere.
60. According to the plate tectonics theory, what drives the motion of the plates? p 269-270. Convection currents
61. True or false High mountains gradually wear down until most of Earth is at sea level. Erosion and weathering processes wear mountains down at the same time that other processes like converging plates are building new mountains.
62. What is the **force** behind Earth's mass movements such as mudflows, lahars, creep, landslides, and rockfalls? Gravity

Volcanoes/Earthquakes

63. Compare and contrast the epicenter and focus of an earthquake. p 218-9 Focus= the point within Earth where the earthquake starts. Epicenter= location on the surface directly above the focus. see diagram on page 219
64. Identify the cause of earthquakes. p 221 " Most earthquakes are produced by the rapid release of elastic energy stored in rock that has been subjected to great forces. When the strength of the rock is exceeded, it suddenly breaks, causing the vibrations of an earthquake."
65. Identify the three types of seismic waves.

TYPE OF WAVE	SPEED	OTHER NAMES	MATERIALS WAVE CAN TRAVEL THROUGH	RESULTS
P wave	Fastest	Primary, push-pull, compression	Solids, liquids, and gases	Temporarily change the volume of the material as they compress and expand it.
S waves	Second fastest	Secondary, shear,	Only through solids	travel through sideways at right angles to the direction of motion and temporarily change the shape of the material.
Surface waves	Slowest		Travel along the surface of Earth	Most destructive of the 3 waves. They move both up-and-down and side-to-side. The side-to-side motion is what does the most damage to buildings

66. Describe the factors contributing to earthquake damage. Pg 229-230 "The damage to buildings and other structures from earthquake waves depends on several factors.

These factors include the intensity and duration of the vibrations, the nature of the material on which the structure is built, and the design of the structure.”

67. Identify other dangers associated with earthquakes. Pg 230-231 Tsunamis, landslides, fire
68. Explain how to locate the epicenter of an earthquake. P 224-225 Use a time-travel graph to locate the distance of an Earthquake from at least 3 recording stations. By using triangulation, you can find the location of the earthquake on Earth. See diagram page 225.
69. Explain the factors that determine the type of volcanic eruptions that occur. (p 281 “The primary factors that determine whether a volcano erupts violently or quietly include magma composition, magma temperature, and the amount of dissolved gases in the magma.” Viscosity is the term that refers to a substance’s resistance to flow. The higher the viscosity, the more explosive the eruption. The ability of a substance to flow is affected by its temperature (think of heating up syrup) and the chemical composition of the material (think glue vs water). Dissolved gases can affect eruptions, too. If you think of opening a hot soda can and a cold soda, a hot can of soda has gases that are at higher pressure due to temperature and so the gases want out of the container. They want out NOW.
70. Describe the various types of volcanic materials that are ejected from volcanoes.(p283 “The fragments ejected during eruptions range in size from very fine dust and volcanic ash (less than 2 millimeters) to pieces that weigh several tons.”
71. List the three main types of volcanoes. (p 284-5 Shield, cinder, composite)
72. Explain the relationship between plate tectonics and volcanism. (p 293 “The basic connection between plate tectonics and volcanism is that plate motions provide the mechanisms by which mantle rocks melt to generate magma.”
73. Why do you think the coastal area along the Pacific Ocean is called “The Ring of Fire”? The Pacific Ocean’s coastline is a converging plate boundary and therefore results in a ring of volcanoes and earthquakes.

Bedrock Geology

74. Contrast ionic, covalent, and metallic bonds. (p. 40-43 "Ionic bonds form between positive and negative ions. Covalent bonds form when atoms share electrons. Metallic bonds form when electrons are shared by metal ions.")
75. List the 5 characteristics of a mineral. (p 45 1. naturally occurring 2. solid substances 3. orderly crystalline structure 4. definite chemical composition 5. generally considered inorganic.)
76. Explain why color is often not a useful property in identifying minerals. p 50 "Small amounts of different elements can give the same mineral different colors."
77. Define the terms luster, crystal form, streak, and Mohs scale p 51-55 "Luster is used to describe how light is reflected from the surface of a mineral." "Crystal form is the visible expression of a mineral's internal arrangement of atoms." "Streak is the color of a mineral in its powdered form." "Mohs scale consist of 10 minerals arranged from 10 (hardest) to 1 (softest)."
78. Define the term rock. p 66 "A rock is any solid mass of mineral or mineral-like matter that occurs naturally as part of our planet."
79. Identify the three major types of rocks and explain how they differ.

Type of rock	Definition	Formation Process
Igneous	Means fire. Think of ignite	Extrusive igneous are formed from magma beneath the surface. Intrusive igneous are formed from hardened lava on surface of Earth.
Sedimentary	Means settling. Think of sediments in a jar of water and how they settle down to the bottom	Formed by compaction and cementation of sediments.
Metamorphic	Means change form. Think of the metamorphic process of a butterfly or the Power Rangers' cry, "It's morphing time!"	Formed when existing rocks are changed by heat, pressure, or hydrothermal solutions.

80. Draw and label the rock cycle. See diagram on page 67.
81. List the forces that power Earth's rock cycle.
82. Compare and contrast intrusive and extrusive igneous rocks. Pg 71 Extrusive igneous are formed from magma beneath the surface. Intrusive igneous are formed from hardened lava on surface of Earth.
83. Demonstrate how the rate of cooling affects an igneous rock's texture. Pg 72 "Slow cooling results in the formation of large crystals." "Rapid cooling of magma or lava results in rocks with small, interconnected mineral grains."
84. Be able to use the Classification of Major Igneous Rocks Table on page 74. Example: Name the rock that is fine-grained and contains amphibole. Answer: Andesite
85. Describe the major processes involved in the formation of sedimentary rocks. Pg 76 Weathering= breaking rock down into sediments through mechanical and chemical actions. Erosion= movement of sediments by wind, water, ice, or gravity. Deposition=

when sediments are dropped. Compaction=process that squeezes or compacts sediments. Cementation=process that "glues" sediments together. Dissolved minerals go between the sediments and glue or cement them together.

86. Distinguish between clastic sedimentary rocks and chemical sedimentary rocks. pg 77
Clastic sedimentary="rocks that are made of weathered bits of rocks and minerals."
Chemical sedimentary= rocks that form "from dissolved minerals that precipitate from water solutions."

87. Identify the features that are unique to some sedimentary rocks. p 78 The many unique features of sedimentary rocks are close to how, when, and where the rocks formed. The layer patterns can give clues on age and type of environment when formed. Fossils can give clues on age, climate, location, and can be used to match up other rock layers.

88. Be able to use the Classification of Major Sedimentary Rocks Table on page 79.

89. Define metamorphism. p 80 Change form.

90. Distinguish between contact metamorphism and regional metamorphism. p 81
"During contact metamorphism, hot magma moves into rock." "Regional metamorphism results in large-scale deformation and high-grade metamorphisms." Think of contact as a small area and regional as a large area affected.

91. Be able to use the Classification of Major Metamorphic Rocks Table on page 84.