The "Geography I.D." Assignment for Students

GEOGRAPHY I.D.

To begin: Complete your personal *Geography I.D*. Use the maps in your text, an atlas, your college catalog, and additional library materials if needed.

Your instructor will help you find additional source materials for data pertaining to the campus.

On each map, find the information requested, noting the January and July temperatures indicated by the isotherms (the small scale of these maps will permit only a general determination), January and July pressures indicated by isobars, annual precipitation indicated by isohyets, climatic region, landform class, soil order, and ideal terrestrial biome.

Record the information from these maps in the spaces provided. The completed page will give you a relevant geographic profile of your immediate environment. As you progress through your physical geography class, the full meaning of these descriptions will unfold. This page might be one you will want to keep for future reference.

[Derived from *Applied Physical Geography: Geosystems in the Laboratory*, eighth edition, by Robert W. Christopherson and Charles E. Thomsen, © 2012 Prentice Hall, Inc., Pearson Education.]

Geography I.D.

Name: ______________________________ Class Section: ______________

Hometown: ________________ Latitude: __________ Longitude: ________________

College/University: ____

City/Town: __________________________ County (Parish): ________________

Standard Time Zone (for College Location): __________________________

Latitude: ____________________ Longitude: ____________________________

Elevation (include location of measurement on campus): ____________________

Place (tangible and intangible aspects that make this place unique): ______________

____

Region (aspects of unity shared with the area: cultural, historical, economic, environmental): ________

____

Population: __________Metropolitan Statistical Area (CMSA, PMSA, if applicable): ____________

Environmental Data: (Information sources used: ______________________________)

January Avg. Temperature: ______________July Avg. Temperature: ______________

January Avg. Pressure (mb): _____________July Avg. Pressure: _________________

Average Annual Precipitation (cm/in.): ______________________________

Avg. Ann. Potential Evapotranspiration (if available; cm/in.): ____________________

Climate Region (Köppen symbol and name description): ______________________

Main Climatic Influences (air mass source regions, air pressure, offshore ocean temperatures, etc.):

____

____

Topographic Region or Structural Region (including rock type, loess units, etc.): ______________

____

Dominant Regional Soil Order: ____________________________________

Biome (terrestrial ecosystems description; ideal and present land use): __________________

Essentials of Geography

1

Key Learning Concepts for Chapter 1

The following learning concepts help guide the student's reading and comprehension efforts. The operative words are in ***bold italics***. These are included in each chapter of *Geosystems*. The student is told: "After reading the chapter, you should be able to":

• ***Define*** geography and physical geography, and ***describe*** spatial analysis.

• ***Summarize*** the scientific process and ***discuss*** human population growth as it relates to geographic science.

• ***Describe*** open and closed systems, feedback, and equilibrium concepts as they relate to Earth systems.

• ***Explain*** Earth's shape and reference grid: latitude, longitude, latitudinal geographic zones, and time zones.

• ***Define*** cartography and mapping basics: map scale and map projections.

• ***Describe*** three geoscience tools—the Global Positioning System (GPS), remote sensing, and geographic information systems (GIS)—and ***explain*** how these tools are used in geographic analysis.

Overview

Welcome to the 10th edition of *Geosystems* and the study of physical geography! In this text, we examine the powerful Earth systems that influence our lives and the many ways humans impact those systems. This is an important time to be studying physical geography and learning about Earth's environments, including the systems that form the landscapes, seascapes, atmosphere, and ecosystems upon which humans depend. In this second decade of the 21st century, a century that will see many changes to our natural world, scientific study of the Earth and environment is more crucial than ever. Our study of physical geography begins with the essentials of this important discipline. The "Essentials of Geography" chapter contains basic tools for the student to use in studying the content of physical geography. After completion of this chapter, you should feel free to follow the integrated sequence of the text or treat the four parts of the text in any order that fits your teaching approach.

Our study of geosystems—Earth systems—begins with a look at the science of physical geography and the geographic tools it uses. Physical geography uses an integrative spatial approach, guided by the scientific process, to study entire Earth systems. The role of humans is an increasingly important focus of physical geography, as are questions of global sustainability as Earth's population grows.

Physical geographers study the environment by analyzing air, water, land, and living systems. Therefore, we discuss systems and the feedback mechanisms that influence system operations. We then consider location on Earth as determined by the coordinated grid system of latitude and longitude and the determination of world time zones. Next, we examine maps as critical tools that geographers use to display physical and cultural information. This chapter concludes with an overview of new and widely accessible technologies that are adding exciting new dimensions to geographic science: global positioning systems, remote sensing from space, and geographic information systems.

Most students have differing notions as to what geography is and what geographers do. Some think that they are going to memorize the capitals of the states, while others think that they are embarking on a search for lands and peoples or that they will be learning things for success with a popular *Jeopardy!* category.

In our own physical and cultural geography classes, we found that many students are unable to name all the states and provinces or identify major countries on outline maps. When we add the complexity of the spatial aspects of Earth's physical systems—e.g., atmospheric energy budgets, temperatures, wind patterns, weather systems, plate tectonics, earthquake and volcano locations and causes, global ecosystems and biodiversity, and terrestrial biomes—the confusion even among the best informed is great, and therein lies our challenge!

Perhaps more than any other issue, climate change has become an overriding focus of the study of Earth systems. Rising atmospheric concentrations of carbon dioxide and other greenhouse gases are changing Earth's energy balance and are linked to increasing global temperatures. Rising air and ocean temperatures affect the entire planet, from the poles to the equator. As a result, Arctic sea ice is declining, and the Greenland and Antarctic Ice Sheets are melting at accelerating rates. Sea level is rising, affecting human populations living in coastal regions. Globally, intense weather events, droughts, and flooding continue to increase. In presenting the state of the planet, *Geosystems* surveys climate change evidence and considers its implications. How can your actions make a difference? In every chapter, we present up-to-date science and information to help you understand our dynamic Earth systems. Welcome to an exploration of physical geography!

A list of key learning concepts begins the chapter and is used to organize the review section, with definitions, key terms and page numbers, and review questions grouped under each concept.

Outline Headings and Key Terms

The first-, second-, and third-order headings that divide Chapter 1 serve as an outline. The key terms and concepts that appear **boldface** in the text are listed here under their appropriate heading in ***bold italics***. All these highlighted terms appear in the text glossary. Note the check-off box (❑) so you can mark class progress.

The outline headings and terms for Chapter 1:

Geosystems Now: Citizen Science in the 21st Century

The Science of Geography

- ❑ ***geography***
- ❑ ***spatial analysis***
- ❑ ***location***
- ❑ ***place***
- ❑ ***movement***
- ❑ ***region***
- ❑ ***human–Earth relationships***

Geographic Subfields

- ❑ ***physical geography***

Geographic Investigation

- ❑ ***process***
- ❑ ***Earth systems science***

The Scientific Process

- ❑ ***scientific method***

Forming and Testing the Hypothesis
Developing a Scientific Theory
Applying Scientific Results

Human–Earth Interactions in the 21st Century

The Human Denominator
Human Population Trends
Global Sustainability

- ❑ ***sustainability science***

Earth Systems Concepts

Systems Theory

- ❑ ***system***

Open Systems

- ❑ ***open system***

Closed Systems

- ❑ ***closed system***

Natural System Example
System Feedback

- ❑ ***feedback loops***
- ❑ ***negative feedback***
- ❑ ***positive feedback***

System Equilibrium

- ❑ ***steady-state equilibrium***
- ❑ ***threshold***

Models of Systems

- ❑ ***model***

Geosystems and Earth's Four "Spheres"

- ❑ ***atmosphere***
- ❑ ***hydrosphere***
- ❑ ***cryosphere***
- ❑ ***lithosphere***
- ❑ ***biosphere***

The Colorado River: A Systems Approach

Location and Time on Earth

Earth's Shape and Dimensions

- ❑ ***geodesy***
- ❑ ***geoid***

Earth's Reference Grid

Latitude

- ❑ ***latitude***
- ❑ ***parallel***

Longitude

- ❑ ***longitude***
- ❑ ***meridian***
- ❑ ***prime meridian***

Great Circles and Small Circles
- ❑ ***great circle***
- ❑ ***small circle***

Global Time Zones
Greenwich Mean Time
- ❑ ***Greenwich Mean Time (GMT)***

Coordinated Universal Time
- ❑ ***Coordinated Universal Time (UTC)***

International Date Line
- ❑ ***International Date Line (IDL)***

Daylight Saving Time
- ❑ ***daylight saving time***

Maps and Cartography
- ❑ ***map***
- ❑ ***cartography***
- ❑ ***digital cartography***

The Scale of Maps
- ❑ ***map scale***

Map Projections
- ❑ ***map projection***

Equal Area or True Shape?
- ❑ ***equal area***
- ❑ ***true shape***

Classes of Projections
- ❑ ***Mercator projection***

Great Circle Routes on Map Projections

Types of Maps
- ❑ ***topography***
- ❑ ***relief***
- ❑ ***topographic map***
- ❑ ***contour lines***

Modern Tools for Geoscience
Global Positioning System
- ❑ ***Global Positioning System (GPS)***

Remote Sensing
- ❑ ***remote sensing***
- ❑ ***photogrammetry***

Satellite Imaging
Passive Remote Sensing
Active Remote Sensing

Geospatial Data Analysis
Geographic Information Systems
- ❑ ***geographic information system (GIS)***

The Human Denominator
Key Learning Concepts Review
Geospatial Analysis

Focus Studies, GeoReports, and Work It Out

Focus Study 1.1: Forms of Energy
Focus Study 1.2: Using GIS to Prevent Aircraft Bird Strikes

GeoReport 1.1: Welcome to the Anthropocene
GeoReport 1.2: Polar-orbiting satellites predict Hurricane Sandy's path

Work It Out 1.1: What Is Your Footprint?
Work It Out 1.2: Locations on Earth
Work It Out 1.3: Time Changes across the Globe

URLs Listed in Chapter 1

Geosystems Now:
www.cocorahs.org

Population Data:
www.census.gov/popclock
www.prb.org/pdf13/2013-population-data-sheet_eng.pdf

Footprint Calculator:
www.footprintnetwork.org/en/index.php/GFN/page/personal_footprint/

Anthropocene:
www.anthropocene.info

Time and UTC:
http://wwp.greenwichmeantime.com/
http://aa.usno.navy.mil/faq/docs/world_tzones.htm

Daylight Savings Time:
www.timeanddate.com/time/dst/

National Map:
http://nationalmap.gov/

Landsat:
http://earthobservatory.nasa.gov

LIDAR:
www.umesc.usgs.gov/mapping/resource_mapping_ltrmp_lidar.html

Avian Hazard Avoidance System:
www.usahas.com/

GIS:
http://disc.sci.gsfc.nasa.gov/

CoCoRaHS:
www.cocorahs.org

Annotated Chapter Review Questions

• ***Define*** geography and physical geography, and ***describe*** spatial analysis.

1. Define physical geography and review the type of analysis that characterizes the geographic sciences.
Geography is the science that studies the interdependence of geographic areas, places, and locations; natural systems; processes; and societal and cultural activities over Earth's surface. Physical geography involves the spatial analysis of Earth's physical environment. Various words denote the geographic context of spatial analysis: space, territory, zone, pattern, distribution, place, location, region, sphere, province, and distance. Spatial patterns of Earth's weather, climate, winds and ocean currents, topography, and terrestrial biomes are examples of geographic topics.

• ***Summarize*** the scientific process and ***discuss*** human population growth as it relates to geographic science.

2. Sketch a flow diagram of the scientific method, beginning with observations and ending with the development of theories.
Observations lead to questions and then to a hypothesis that is tested and retested. If the results of the tests support the hypothesis, it may be considered a theory. A scientific theory is the result of several extensively tested hypotheses.

3. Summarize current population growth and sustainability issues in your own words: population size, global distribution, the impact per person, and future projections.
The global human population passed 6 billion in August 1999 and continued to grow at the rate of 82 million per year, adding another billion by 2011, when the 7 billionth human was born. Billion-mark milestones have occurred at ever closer intervals. Our population is expected to keep rising until 2050, when it will level off at around 9.5 billion. A key strategy is reducing our ecological footprint, which requires an awareness of the impact that our choices have. When the population of over 7 billion is taken into account, the human footprint on Earth is enormous in its strength and spatial influence. Shrinking this footprint ties to sustainability science and can be accomplished at levels ranging from the global community to nations, regions, neighborhoods, and individuals.

• ***Describe*** open and closed systems, feedback, and equilibrium concepts as they relate to Earth systems.

4. What is the difference between an open system and a closed system? Describe an example of an open system.
Simply stated, a system is any set of ordered, interrelated objects, things, components, or parts and their attributes, as distinct from their surrounding environment. A natural system is generally not self-contained: inputs of energy and matter flow into the system, whereas outputs of energy and matter flow from the system. Such a system is referred to as an open system; examples include the human body, a lake, and a wheat plant. A system that is shut off from the surrounding environment so that it is self-contained is known as a closed system.

5. What is the difference between a positive feedback loop and a negative feedback loop?
As a system operates, information is generated in the system output that can influence continuing system operations. These return pathways of information are called feedback loops. Feedback can cause changes that in turn guide further system operations. If the information amplifies or encourages responses in the system, it is called positive feedback. On the other hand, negative feedback tends to slow or discourage responses in the system, forming the basis for self-regulation in natural systems and regulating the system within a range of tolerable performance. When the rates of inputs and outputs in the system are equal and the amounts of energy and matter in storage within the system are constant or, more realistically, when they fluctuate around a stable average, the system is in a steady-state equilibrium.

• ***Explain*** Earth's shape and reference grid: latitude, longitude, latitudinal geographic zones, and time zones.

6. In which latitudinal geographic zone do you live?
Personal answer, but probably midlatitudes. Figure 1.14 portrays these latitudinal geographic zones, their locations, and their names: equatorial, tropical, subtropical, midlatitude, subarctic or subantarctic, and arctic or antarctic.

7. What and where is the prime meridian?
In 1884, the International Meridian Conference was held in Washington, D.C. After lengthy debate, most participating nations chose the Royal Observatory at Greenwich as the place for the prime meridian of 0° longitude. An important corollary of the prime meridian is the location of the 180° meridian on the opposite side of the planet. Termed the International Date Line, this meridian marks the place where each day officially begins (at 12:01 A.M.) and sweeps westward across Earth. This westward movement of time is created by Earth's turning eastward on its axis.

• ***Define*** cartography and mapping basics: map scale and map projections.

8. What is map scale? In what three ways may it be expressed on a map?
The expression of the ratio of a map to the real world is called scale; it relates a unit on the map to a similar unit on the ground. A 1:1 scale would mean that a centimeter on the map represents a centimeter on the ground—certainly an impractical map scale, for the map would be as large as the area being mapped. A more appropriate scale for a local map is 1:24,000. Map scales may be presented in several ways: written, graphic, and as a representative fraction.

9. What does a contour line represent on a topographic map?
A contour line is a type of isoline, a line on a map that connects points of equal value. A topographic map, or "topo" map, shows position and elevation on Earth's land surface using contour lines connecting all points at the same elevation.

• ***Describe*** three geoscience tools—the Global Positioning System (GPS), remote sensing, and geographic information systems (GIS)—and ***explain*** how these tools are used in geographic analysis.

10. How does a GPS find your location and elevation on Earth? Give an example of GPS technology used for scientific purposes.
The Global Positioning System (GPS) comprises at least 27 orbiting satellites, in 6 orbital planes, that transmit navigational signals to a receiver that calculates latitude and longitude within 10 m (33 ft) and elevation within 15 m (49 ft) and displays the results.

Scientists use GPS to study ground deformation on Mount St. Helens, record the movement of earthquake faults, and track wild animals.

11. What is remote sensing? What is remote sensing? What are you viewing when you observe a LIDAR image?
Remote sensing refers to obtaining information about a distant subject without having physical contact. Remote sensors on satellites and other craft sense a broader range of wavelengths than can our eyes. They can be designed to "see" wavelengths shorter than visible light (ultraviolet) and wavelengths longer than visible light (infrared and microwave radar).

LIDAR systems, typically fitted to aircraft, collect highly detailed and accurate data for surface terrain using lasers. GPS systems onboard the aircraft determine the location of each pulse, resulting in a "point cloud" of data that can be used to generate different types of geospatial models. The data can be filtered to show bare ground or the top of the tree canopy.

GIA GEOquiz

1. Explain: Which spheres represent Earth's abiotic environment? How are these spheres distinct from one another?
The atmosphere, hydrosphere, and lithosphere are all abiotic spheres. They represent the gaseous, liquid, and solid elements of Earth's environment.

2. Compare: What are two main sources of energy for processes in Earth's systems? Based on the illustration, give an example of processes that involve each form of energy.
Incoming solar radiation provides the energy input that drives Earth's physical systems, determining weather and climate patterns and influencing living organisms. Internal processes produce flows of heat and material from deep below Earth's crust. Photosynthesis is driven by solar energy, while plate tectonics is driven by Earth's internal energy.

Work It Out

Work It Out 1.1: What Is Your Footprint?

1. How many planet Earths would be needed to supply enough resources if everyone lived like you?
Personal answer.

2. How many global acres of Earth's productive area would it take to support your current lifestyle?
Personal answer.

3. In what lifestyle area did your changes reduce your footprint?
Personal answer.

Work It Out 1.2: Locations on Earth

1. What is the geographic location (latitude and longitude) in degrees, minutes, and seconds, and as decimal degrees?
Personal answer.

2. In which latitudinal geographic zone does it fall? (Look back to Figure 1.14.)
Personal answer.

3. What is the geographic location (latitude and longitude) of Fairbanks, Alaska? In which latitudinal zone is this city?
64° 50′ 37″ N, 147° 43′ 23″ W
64.843611, -147.723056
It is in the subarctic latitudinal zone (55° to 66.5°.

4. How many degrees of latitude and longitude separate your location from Fairbanks?
Personal answer.

Work It Out 1.3: Time Changes across the Globe

1. When it is 11:00 P.M. in Greenwich, England, what is the time in New York?
6 P.M.

2. When it is 5 P.M. in Denver, Colorado, what is the time in Cairo, Egypt?
1 A.M.

3. When it is 9 A.M. in Tokyo, Japan, what is the time in Mexico City? In New Delhi, India?
6 P.M. in Mexico City, 5:30 A.M. in New Delhi.

Geospatial Analysis
Citizen Science

1. During the last seven days, how many days had precipitation reports?
Personal answer.

2. What is the precipitation total for the week? If applicable, how many inches of snow?
Personal answer.

3. Do these reports reflect what you experienced during those same days? Explain and analyze.
Personal answer.

4. Notice that for a given day not all of the stations report the same amount of precipitation. What might be an explanation for this?
Local variations due to topography and the locations of the sensors.

5. What is the precipitation total for the week? How many inches of snow?
Personal answer.