

EXAM
CODE **171**

CATALOG
NUMBER **PHYx120**

TAKE ADVANTAGE OF ONLINE
**PRACTICE
EXAMS**
SEE PAGE 5 FOR DETAILS

Weather & Climate

CREDIT
HOURS

3

LEVEL

LOWER

PUBLISHED FEBRUARY 2021

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SECTION ONE

Preparing for the Exam

Before You Choose This UExcel Exam

Uses for the Examination

- Excelsior College, the test developer, recommends granting three (3) semester hours of lower-level undergraduate credit to students who receive a letter grade of C or higher on this examination.
- Other colleges and universities also recognize this exam as a basis for granting credit or advanced standing.
- Individual institutions set their own policies for the amount of credit awarded and the minimum acceptable score.

Examinees who have applied to Excelsior College should ask their academic advisor where this exam fits within their degree program.

Examinees **not enrolled** in an Excelsior College degree program should check with the institution from which they wish to receive credit to determine whether credit will be granted and/or to find out the minimum grade required for credit. Those who intend to enroll at Excelsior College should ask an admissions counselor where this exam fits within their intended degree program.

For more information on exam availability and actual testing information, see the [Exam Registration and Information Guide](#).

Examination Length and Scoring

This examination consists of 120 multiple choice and other type questions. You will have two (2) hours to complete the exam. Your score will be reported as a letter grade. Questions are scored either correct (1) or incorrect (0). There is no partial credit. Each credit-bearing exam contains pretest questions, which are embedded throughout the exam. They are indistinguishable from the scored questions. It is to your advantage to do your best on all the questions. Pretest questions are being tried out for use in future versions of the exam.

The UExcel exams do **not** have a fixed grading scale such as A = 90–100%, B = 80–90%, and so forth, as you might have seen on some exams in college courses. Each UExcel test has a scale that is set by a faculty committee and is different for each exam. The process, called standard setting, is described in more detail in the [Technical Handbook](#). Excelsior puts each exam through a standard setting because different test questions have different levels of difficulty. To explain further, getting 70% of the questions right on the exam when the questions are easy does not show the same level of proficiency as getting 70% of questions correct when the questions are hard. Every form of a test (a form contains the test questions) has its own specific grading scale tailored to the particular questions on each exam form.

Please also note that on each form, some of the questions (referred to as pretest questions) count toward the score and some do not; the grading scale applies only to those questions that count toward the score. The area with percentage ratings on the second page of your score report is intended to help identify relative strengths and weaknesses and which content areas to emphasize, should you decide to take the examination again. Your grade

is **based on only the scored questions**. Therefore, the percentage ratings do not necessarily reflect the total percentage that counted toward your grade.

For the best view of the types of questions on this exam, see the sample questions in the back of this guide. Practice, practice, practice!

Score Reporting

For most of our examinations, based on performance, an examinee is awarded a letter grade of A, B, C, or F. A letter grade of D can be given, but credit is awarded for A, B, and C letter grades only. The letter grades reported to examinees indicate that their performance was equivalent to the performance of students who received the same letter grade in a comparable, on-campus course.

More specifically, the letter grade indicates the examinee's proficiency relative to the learning outcomes specified in the exam content guide. Following are general descriptions of examinee performance at each level:

Letter Grade Description

- A Highly Competent: Examinee's performance demonstrates an advanced level of knowledge and skill relative to the learning outcomes.
- B Competent: Examinee's performance demonstrates a good level of knowledge and skill relative to the learning outcomes.
- C Marginally Competent: Examinee's performance demonstrates a satisfactory level of knowledge and skill relative to the learning outcomes.
- D Not Competent (no credit recommended): Examinee's performance demonstrates weak knowledge of the content and minimal skill relative to the learning outcomes.^①
- F Fail (no credit recommended): Examinee's performance demonstrates no knowledge of the content and no skill in the subject relative to the learning outcomes.

Credit is transcripted by Excelsior College for examinees who achieve letter grades of C or higher.

We encourage colleges and universities to use the Excelsior College letter grades of A, B, and C as acceptable standards for awarding credit.

^① In general, two-hour exams do not award a D letter grade.

See page 27, at the back of this content guide, for a sample UExcel Grade Report for Examinations.

Excelsior College Bookstore

The Excelsior College Bookstore offers recommended textbooks and other resources to help you prepare for UExcel exams.

The bookstore is available online at (login required): www.excelsior.edu/bookstore

Excelsior College Library

Library services are available to students enrolled in a degree program at Excelsior College. Created through our partnership with the Sheridan Libraries of The Johns Hopkins University, the library provides access to journal articles, books, websites, databases, reference services, and many other resources. To access the Excelsior College Library, visit www.excelsior.edu/library (login is required). Access to the library is available 24/7.

Take Charge of Your Own Learning

At Excelsior College, independent, self-directed study supported by resources we help you find is not a new concept. We have always stressed to students who take exams that they are acting as their own teacher, and that they should spend as much time studying for an exam as they would spend in a classroom and on homework for a corresponding college course in the same subject area.

Begin by studying the content outline contained in this content guide, at its most detailed level. You will see exactly which topics are covered, and where chapters on those topics can be found in the Recommended Resources. You will see exactly where you might need to augment your knowledge or change your approach.

The content outline, along with the learning outcomes for this exam and recommended textbooks, will serve as your primary resources.

How Long Will It Take Me to Study?

Study for a UExcel exam is comparable to an equivalent college-level course. As an independent

learner, you should study and review as much as you would for the same subject in a campus-based college course. If you already have a background in the subject, you may be able to pass the exam successfully with fewer hours of study. It depends upon the learner as well as the subject, the number of credits (for example, a 6- or 8-credit exam will require more hours of study than a 3-credit exam), and the length of the exam. We strongly encourage you to create a long-term action or study plan, so that you have a systematic approach to prepare for the exam. We've included guidelines for creating such a plan.

How Can I Create an Effective Long-Term Study Plan?

1. Determine the time you will require to complete your preparation for this exam. If you have not studied the subject before, you should plan to budget approximately 45 hours of study time for every credit: 135 hours for 3 credits, 180 hours for 4 credits, 270 hours for 6 credits, and 360 hours for 8 credits. These hours are rules of thumb based on expectations for a student taking a course in the subject; it may take you more or less time, depending on how familiar you are with the material and how easily you absorb the information studying on your own. Aside from the content review, you should then factor in time to search for and use other resources, and to complete any projects and assignments in the study materials that will clarify your understanding of the topics in the content outline (that part in the content guide where the specific areas of study are spelled out). Spend more time on concepts and areas in which you feel you are weak. Totaled, this is approximately the amount of time you should expect to devote to a three-credit, campus-based course. The actual amount of time you require depends on many factors, and will be approximate. If your background is weak, you may need to set aside substantially more than 135–150 hours. If your background is strong, you may budget less time.

Take a few minutes to review the content outline to assess your familiarity with the content. Then, in the space below, write the number of hours you will allocate to complete preparing for the exam.

Hours Required =

2. Determine the time you will have available for study.

In self-study, you need structure, as well as motivation and persistence, and a methodical approach to preparation. There is no set class to keep you on task. You have to do that yourself. Construct a time-use chart to record your daily activities over a one-week period. The most accurate way to do this is to complete the chart on a daily basis to record the actual amount of time you spend eating, sleeping, commuting, working, watching television, caring for others and yourself, reading, and everything else in an adult's life. However, if your schedule is regular, you might prefer to complete the chart in one sitting and, perhaps, by consulting your appointment book or planner.

After you have recorded your activities, you will be ready to schedule study periods around these activities or, perhaps, instead of some of them. In the space below, write the number of hours you will be able to set aside for study each week.

Hours Required =

3. Divide the first number by the second number.

This will give you the number of weeks you will need to set aside for independent study. For example, if you think you will require 170 hours of study and you have 10 hours available to study each week, divide 170 hours by 10 hours and you will get 17. This means that you will need about 17 weeks to complete this course of study. However, you will also need to allow about a week for review and self-testing. Moreover, to be on the safe side, you should also add two weeks to allow for unforeseen obstacles and times when you know you will not be able to study (e.g., during family illnesses or holidays). So, in this case, you should allot a total of 18 to 19 weeks to complete your study.

4. Schedule your examination to coincide with the end of your study period.

For example, if you plan to allow 18 weeks for study, identify a suitable examination date and begin study at least 18 weeks before that date. (The date you begin study assumes that you will have received all of your study materials, particularly textbooks, by that time.)

5. Format a long-term study plan.

You will need to use a calendar, planner, or some other tool to format and track your long-term study plan. Choose a method that is convenient and one that keeps you aware of your study habits on a daily basis. Identify the days and exact hours of each day that you will reserve for study throughout your whole independent study period. Check to see that the total number of hours you designate for study on your long-term study plan adds up to the number of hours you have determined you will need to complete this course of study (Step 1).

6. Record in your long-term study plan the content you plan to cover during each study period.

Enter the session numbers, review, and examination preparation activities you will complete during each study period. While it is suggested that approximately 160–170 hours of study is required for this exam, each and every student may require different timelines based on their comfort with, and comprehension of, the material.

You now have a tentative personal long-term study plan. Keep in mind that you will have to adjust your study plan, perhaps several times, as you study. It is only by actually beginning to work systematically through the material, using the content outline, that you will be able to determine accurately how long you should allow for each unit.

What Learning Strategy Should I Use?

The following guidelines are intended to help you acquire the grounding in the knowledge and skills required for successful completion of this examination.

1. Approach learning with a positive attitude.

Most students are capable of learning subject content if they devote enough time and effort to the task. This devotion will give you a positive edge and a feeling of control.

2. Diligently complete the exact work you specified in your study plan.

Your study plan is being designed for the specific purpose of helping you achieve the learning outcomes for this exam.

3. Be an active learner.

You should actively engage in the learning process. Read critically, take notes, and continuously monitor your comprehension. Keep a written record of your progress, highlight content you find difficult to grasp, and seek assistance from someone in your learning community who can help you if you have difficulty understanding a concept.

4. Be patient: you may not understand everything immediately.

When encountering difficulty with new material, be patient with yourself and don't give up. Understanding will come with time and further study. Sometimes you may need to take a break and come back to difficult material. This is especially true for any primary source material (original letters, documents, and so forth) that you may be asked to read. The content outline will guide you through the material and help you focus on key points. You will find that many concepts introduced in earlier sessions will be explained in more detail in later sessions.

5. Apply your learning to your daily life.

Use insights you gain from your study to better understand the world in which you live. Apply the learning whenever you can. Look for instances that support or contradict your reading on the subject.

6. Accommodate your preferred way of learning.

How do you learn best? Common ways to learn are reading, taking notes and making diagrams, and by listening to someone (on video or live). Others learn by doing. Do any of these descriptions apply to you? Or does your learning style vary with the learning situation? Decide what works for you and try to create a learning environment to accommodate your preferences.

Study Tips

Become an active user of the resource materials. Aim for understanding rather than memorization. The more active you are when you study, the more likely you will be to retain, understand, and apply the information.

The following techniques are generally considered to be active learning:

- **preview or survey** each chapter

- **highlight or underline text** you believe is important
- **write questions or comments** in the margins
- **practice re-stating content** in your own words
- **relate what you are reading** to the chapter title, section headings, and other organizing elements of the textbook
- **find ways to engage** your eyes, your ears, and your muscles, as well as your brain, in your studies
- **study with a partner or a small group**
- **prepare your review notes** as flashcards or create recordings that you can use while commuting or exercising

When you feel confident that you understand a content area, review what you have learned. Take a second look at the material to evaluate your understanding. If you have a study partner, the two of you can review by explaining the content to each other or writing test questions for each other to answer. Review questions from textbook chapters may be helpful for partner or individual study, as well.

Study smart for your UExcel exam! Success starts with establishing a relationship with your advisor.

Using UExcel Practice Exams

The official UExcel practice exams are highly recommended as part of your study plan. They can be taken using any computer with a supported web browser such as Google Chrome.

The practice exam package comes with two sets of questions. Please be aware that there will be fewer questions on the practice exams than there will be on the exam you take for credit. Generally, the practice questions will not be the same as the ones you will see when you take the actual exam for credit. They are intended to expose you to the types of questions you'll encounter in the actual exam. Practice questions are a tool, and do not provide a full exam experience. For example, the practice question sets do not have time limitations. Begin with the Content Guide, especially the detailed content outline. Memorizing specific questions and answers on the practice sets is not as effective as using the questions to practice, along with the content outline, to see which concepts you may need to study further. To register for the practice exam, visit www.excelsior.edu and log into your MyExcelsior

account. **Please note: You must be registered for the corresponding credit-bearing exam before you can register for the practice exam.**

Practice exams are not graded. Rather, they are intended to help you make sure you understand the subject and give you a sense of what the questions will be like on the exam for credit. Ideally, you would check any questions you got wrong, look at the explanations, and go back to the textbook to reinforce your understanding. After taking both forms of the practice exam, you should feel confident in your answers and confident that you know the material listed in the content outline.

Practice exams are one of the most popular study resources. Practice exams are typically shorter than the credit-bearing exam. Since the questions are drawn from the same pool of questions that appear on the credit-bearing exam, what you will see when you sit for the graded exam will be roughly the same. Used as intended, these practice exams will enable you to:

- Review the types of questions you may encounter on the actual exam.
- Practice testing on a computer in a timed environment.
- Practice whenever and wherever it is convenient for you.

Take two different forms of a practice exam within a 180-day period. (We highly recommend that you take the first form of the practice exam as a pretest, early in the study period. Use the results to identify areas to further study and carry out a plan. Then take the second form as a post-test and see how much you have improved.)

Although there is no guarantee, our research suggests that exam takers who do well on the practice exams are more likely to pass the actual exam than those who do not take advantage of the opportunity. Note that since the practice exams are not graded (calibrated) the same way as the scores on the credit-bearing exam, it will be hard for you to use the practice exams as a way to predict your score on the credit-bearing exam. The main purpose of the practice exams is for you to check your knowledge and to become comfortable with the types of questions you are likely to see in the actual, credit-bearing exam.

About Test Preparation Services

Preparation for UExcel® exams and Excelsior College® Examinations, though based on independent study, is supported by Excelsior College with a comprehensive set of exam learning resources and services designed to help you succeed. These learning resources are prepared by Excelsior College so you can be assured that they are current and cover the content you are expected to master for the exams. These resources, and your desire to learn, are usually all that you will need to succeed.

There are test-preparation companies that will offer to help you study for our examinations. Some may imply a relationship with Excelsior College and/or make claims that their products and services are all that you need to prepare for our examinations.

Excelsior College does not endorse the products and services of any tutorial or test preparation firm. We do not review the materials provided by these firms for the content or compatibility of their material and resources with UExcel® exams or Excelsior College Examinations®. No test preparation vendor is authorized to provide admissions counseling or academic advising services, or to collect any payments, on behalf of Excelsior College. Excelsior College does not send authorized representatives to a student's home nor does it review the materials provided by test preparation companies for content or compatibility with Excelsior College examinations.

To help you become a well-informed consumer, we suggest that before you make any purchase decision regarding study materials provided by organizations other than Excelsior College, you consider the points outlined on our website at www.excelsior.edu/testprep.

Exam Preparation Strategies

Each learner is different. However, all learners should read the content outline in the exam's Content Guide and ensure that they have mastered the concepts. For someone with no prior knowledge of the subject, a rule of thumb is 135 hours of study for a 3-credit exam—this number is just to give you an idea of the level of effort you will need, more or less.

Content Guides

This content guide is the most important resource. It lists the outcomes, a detailed content outline of what is covered, and textbooks and other study resources. It also has sample questions and suggestions for how to study. Content guides are updated periodically to correspond with changes in particular examinations and in textbook editions. Examinees can download any of the latest free UExcel content guides by visiting the individual exam page or from the list at www.excelsior.edu/contentguides.

Using the Content Outline

Each content area in the content outline includes the most important sections of the recommended resources for that area. These annotations are not intended to be comprehensive. You may need to refer to other chapters in the recommended textbooks. Chapter numbers and titles may differ among textbook editions.

This content outline contains examples of the types of information you should study. Although these examples are many, do not assume that everything on the exam will come from these examples. Conversely, do not expect that every detail you study will appear on the exam. Any exam is only a broad sample of all the questions that could be asked about the subject matter.

Using the Sample Questions and Rationales

Each content guide provides sample questions to illustrate those typically found on the exam. These questions are intended to give you an idea of the level of knowledge expected and the way questions are typically phrased. The sample questions do not sample the entire content of the exam and are not intended to serve as an entire practice test.

Recommended Resources for the UExcel Exam in Weather & Climate

The resources listed below were selected by the faculty members on the examination committee for use in developing this exam.

Resources listed under “Strongly Recommended” were used by the committee to verify all the questions on the exam. Please refer to the Content Outline to see which parts of the exam are cross-referenced to these resources.

Resources listed under “Optional” provide additional material that may deepen or broaden your understanding of the subject, or that may provide an additional perspective on the exam content. Textbook resources, both Strongly Recommended and Optional, may be purchased from the [Excelsior College Bookstore](#).

You should allow ample time to obtain the necessary resources and to study sufficiently before taking the exam, so plan appropriately, with an eye towards your own personal learning needs. See the sections in this guide on the Excelsior College Bookstore and the Excelsior College Library, and under Reducing Textbook Costs, to help you secure the Strongly Recommended resources successfully.

Textbook Editions

Textbook editions listed in the UExcel content guides may not be the same as those listed in the bookstore. Textbook editions may not exactly match up in terms of table of contents and organization, depending upon the edition. However, our team of exam developers checks exam content against every new textbook edition to verify that all subject areas tested in the exam are still adequately available in the study materials. If needed, exam developers will list additional Strongly Recommended resources to ensure that all topics in the exam are still sufficiently covered. Public libraries may have the textbooks you need, or may be able to obtain them for you through interlibrary loan to reduce textbook costs. You may also consider financial aid, if you qualify, to further help defray the steep cost of textbooks. A section on open educational

resources (OER) has been included in this guide to help you locate additional, possibly free resources to augment your study.

Strongly Recommended

Aguado, E., & Burt, J.E. (2015). *Understanding weather and climate* (7th ed.). Boston: Pearson.

The study materials may be purchased from the [Excelsior College Bookstore](#).

Optional Resources

The examination development committee did not identify any specific Optional resources for this exam. If you would like to explore topics in more depth, we encourage you to refer to available Open Educational Resources (OER).

Reducing Textbook Costs

Many students know it is less expensive to buy a used textbook, and buying a previous edition is also an option. The Excelsior College bookstore includes a buyback feature and a used book marketplace, as well as the ability to rent digital versions of textbooks for as long as students need them. Students are encouraged to explore these and the many other opportunities available online to help defray textbook costs.

Open Educational Resources

There are many resources available online free of charge that may further enhance your study for the exam. Known as Open Educational Resources (OER), these may be textbooks, courses, tutorials, or encyclopedias. Any additional OER that you find independently should be used to augment study—not as replacements for the Strongly Recommended resources.

Most sites for university-based OER can be searched through www.ocwconsortium.org and/or www.oercommons.org.

Sites that specialize in web courses designed by college professors under contract with the website sponsor, rather than in web versions of existing college courses, include:

www.education-portal.com

www.opencourselibrary.org (abbreviated as OCL)

We have included specific courses that cover material for one or more UExcel® exams from the sites in the listings above. It's worth checking these sites frequently to see if new courses have been added that may be more appropriate or may cover an exam topic not currently listed.

Sites like Khan Academy (www.khanacademy.com) and iTunes U feature relatively brief lessons on very specific topics rather than full courses. Full courses are also available on iTunes U (<http://www.apple.com/education/ipad/itunes-u/>). We have chosen a few courses and collections for this listing.

Open Online Textbooks

BookBoon

<http://bookboon.com/en/textbooks-ebooks>

Flatworld Knowledge

<http://catalog.flatworldknowledge.com/#our-catalog>

College Readiness

Khan Academy

<http://www.khanacademy.org/>

Hippocampus

<http://www.hippocampus.org/>

Open Course Library

<http://opencourselibrary.org/collg-110-college-success-course/>

Study Aids

Education Portal

<http://education-portal.com/>

Khan Academy

<http://www.khanacademy.org/>

Annenberg Learner

<http://www.learner.org/>

OpenCourseWare

<http://ocwconsortium.org/en/courses/search>

OER Commons

<http://www.oercommons.org/>

Open Course Library

<http://www.opencourselibrary.org/>

To achieve academic success, rate yourself at Excelsior College's Self-Regulated Learning Lab. Visit the Diagnostic Assessment & Achievement of College Skills site at <https://srl.daacs.net/>

It's free!

SECTION TWO

Content Outline

General Description of the Examination

The UExcel Weather and Climate examination is based on material typically taught in a one-semester lower-level course in weather and climate. The content of the examination corresponds to course offerings such as Weather and Climate I, Introduction to Atmospheric Science, Introduction to Weather and Climate, and Introduction to Meteorology.

The examination measures comprehension of college-level meteorology and atmospheric science skills and concepts. In particular, it measures knowledge and understanding of the following major themes: observing, analyzing, describing, and diagramming the basics of major atmospheric processes including, energy, pressure, wind, precipitation, air masses, fronts, storm systems, and basic climate and weather patterns, and understanding the physical processes and mechanisms underlying weather and climate behaviors and phenomena.

No prior knowledge of weather and climate is required before beginning study for this exam.

Learning Outcomes

After you have successfully worked your way through the recommended study materials, you should be able to demonstrate the following learning outcomes:

1. Interpret and diagram basic atmospheric processes including energy, pressure, wind, precipitation, air masses, fronts, storm systems, and climate and weather patterns. (Aligns to GECC 2.1)
2. Examine the physical processes and mechanisms underlying weather and climate behaviors and phenomena. (Aligns to GECC 2.1)
3. Perform basic calculations pertinent to these processes and mechanisms (energy, pressure, wind, precipitation, air masses, fronts, weather and climate patterns, and storm systems). (Aligns to GECC 2.2)
4. Recognize and diagram how these processes and mechanisms (energy, pressure, wind, precipitation, air masses, fronts, weather and climate patterns, and storm systems) are linked in a weather and climate system. (Aligns to GECC 2.1)
5. Summarize the impacts of weather and climate on human activity and the impacts of human activity on weather and climate. (Aligns to GECC 2.1)

General Education Career Competencies Addressed in this Exam

GECC-2: Mathematical and Scientific Problem Solving: Apply scientific knowledge and reasoning to make evidence-based decisions. Apply mathematical concepts and reasoning to solve problems that involve quantitative information.

Content Outline

The content outline describes the various areas of the test, similar to the way a syllabus outlines a course. To fully prepare requires self-direction and discipline. Study involves careful reading, reflection, and systematic review.

The major content areas on the Weather & Climate examination, the percent of the examination, and the hours to devote to each content area are listed below.

Content Area	Percent of the Examination	Hours of Study*
I. Characteristics and Behaviors of the Atmosphere	30%	41
II. Hydrologic Cycle and the Atmosphere, Weather, and Climate	20%	27
III. Forms of Weather	20%	27
IV. Human Factors	15%	20
V. Climate	15%	21
Total	100%	

*Approximate: For those examinees who know the topic well, less time may be needed to learn the subject matter. For those who are new to the subject matter, more time may be required for study.

NOTE: Occasionally, examples will be listed for a content topic to help clarify that topic. However, the content of the examination is not limited to the specific examples given.

I. Characteristics and Behaviors of the Atmosphere

30 PERCENT OF EXAM

Ch. 1, Composition and Structure of the Atmosphere

Ch. 2, Solar Radiation and the Seasons

Ch. 3, Energy Balance and Temperature

Ch. 4, Atmospheric Pressure and Wind

Appendix A, Units of Measurement and Conversions

Appendix C, Weather Map Symbols

Appendix D, Weather Extremes

A. Energy and matter

1. Definitions
 - a. Weather
 - b. Climate
 - c. Atmosphere
2. Characteristics of the atmosphere
 - a. Composition
 - 1) Permanent gases
 - 2) Variable gases
 - 3) Aerosols
 - b. Vertical Structure
 - 1) Density
 - 2) Pressure
 - 3) Electrical properties
 - 4) Temperature
 - 5) Humidity
 - c. Observations

- 1) History
- 2) Air
- 3) Land
- 4) Sea
- 5) Remote sensing

B. Solar radiation

1. Energy
 - a. Types
 - 1) Kinetic
 - 2) Potential
2. Characteristics of radiation
 - a. Intensity and wavelength
 - 1) Stefan-Boltzmann Law
 - 2) Wien's Law
3. The solar constant
 - a. The inverse square law
 - b. Variations
4. Earth's seasons
 - a. Earth's revolution and rotation
 - b. Climate
5. Solar radiation transfer
 - a. Absorption
 - b. Reflection
 - c. Scattering
 - 1) Rayleigh scattering
 - 2) Mie scattering
 - 3) Nonselective scattering
6. Energy transfer processes
 - a. Surface-atmosphere radiation exchange
 - b. Conduction
 - c. Convection
 - 1) Free convection
 - 2) Forced convection
 - d. Sensible heat
 - e. Latent heat
 - f. Advection

- g. Net radiation and global temperature
- h. Latitudinal variations
7. The greenhouse effect
 - a. Climate
 - b. Human interactions and responses
8. Temperature
 - a. Influences on temperature
 - 1) Latitude
 - 2) Altitude and elevation
 - 3) Atmospheric circulation patterns
 - 4) Contrasts between land and water
 - 5) Warm and cold ocean currents
 - 6) Local conditions
 - b. Daily and annual temperature patterns
 - 1) Daytime heating and nighttime cooling
 - 2) Effects of cloud cover and wind
 - c. Measurement of temperature
 - d. Temperature means and ranges
 - e. Useful temperature measures
 - f. Thermodynamic diagrams and vertical temperature profiles
 - g. Observed patterns by seasons and climates

C. Atmospheric pressure and wind

1. Pressure
 - a. The concept of pressure
 - 1 Dalton's Law
 - b. Vertical and horizontal changes in pressure
 - c. The equation of state (ideal gas law)
 - d. Measuring pressure
 - 1) Barometers and barometric pressure
 - 2) Pressure as a force

- e. The distribution of pressure
 - 1) Pressure gradients
 - a) Horizontal pressure gradient
 - b) Vertical pressure gradient
 - 2) Hydrostatic equilibrium
- 2. Wind
 - a. Forces affecting the speed and direction
 - 1) The Coriolis effect
 - 2) Friction
 - b. Wind in the upper atmosphere
 - 1) Geostrophic flow
 - 2) Gradient flow
 - 3) Supergeostrophic and subgeostrophic flow
 - c. Near-surface winds
 - d. Anticyclones, cyclones, troughs, and ridges
 - e. Measuring wind
- D. Units of measurement and conversion, weather map symbols, and observations

II. Hydrologic Cycle and the Atmosphere, Weather, and Climate

20 PERCENT OF EXAM

- Ch. 5, Atmospheric Moisture
 - Ch. 6, Cloud Development and Forms
 - Ch. 7, Precipitation Processes
-

A. Atmospheric moisture

- 1. The hydrologic cycle
- 2. Water vapor and liquid water
 - a. Evaporation and condensation
- 3. Measures of water vapor content
 - a. Vapor pressure
 - b. Absolute humidity
 - c. Specific humidity
 - d. Mixing ratio

- e. Relative humidity
- f. Dew point
- 4. Measuring humidity
- 5. Distribution of water vapor
- 6. Processes that cause saturation
- 7. Saturation
 - a. Processes
 - b. Factors
 - 1) Condensation nuclei
 - 2) Ice nuclei
- 8. Diabatic and adiabatic processes
 - a. Diabatic processes
 - 1) Second law of thermodynamics
 - b. Adiabatic processes
 - 1) First law of thermodynamics
 - 2) Adiabatic lapse rates
 - c. Lapse rates
 - 1) Standard atmosphere
 - 2) Environmental lapse rate (ELR)
 - 3) Dry adiabatic lapse rate (DALR)
 - 4) Moist adiabatic lapse rate (MALR)
- 9. Forms of condensation
 - a. Dew
 - b. Frost
 - c. Fog
 - 1) Typology
 - 2) Distribution
- 10. Formation and dissipation of cloud droplets
- 11. High humidity and human discomfort
- 12. Atmospheric moisture and climate variability
- B. Cloud development and forms
 - 1. Mechanisms that lift air
 - a. Orographic uplift
 - b. Frontal lifting

- c. Convergence
- d. Localized convection
- 2. Static stability and the environmental lapse rate
 - a. Absolutely unstable air
 - b. Absolutely stable air
 - c. Conditionally unstable air
 - d. Static and potential instability
- 3. Factors influencing the environmental lapse rate (ELR)
 - a. Heating or cooling of the lower atmosphere
 - b. Advection of cold and warm air at different levels
 - c. Advection of an air mass with a different ELR
- 4. Limitations on the lifting of unstable air
- 5. Extremely stable air: inversions
- 6. Cloud types
 - a. High clouds
 - b. Middle clouds
 - c. Low clouds
 - d. Clouds with vertical development
 - e. Unusual clouds
- 7. Cloud coverage, observation, and climate

C. Precipitation process

- 1. Growth and cloud droplets
 - a. Growth by condensation
 - b. Growth in warm clouds
 - 1) Collision
 - 2) Coalescence
 - c. Growth in cool and cold clouds
 - 1) Bergeron process
 - 2) Riming and aggregation
- 2. Distribution and forms of precipitation
 - a. Snow
 - 1) North American distribution

- 2) Local/regional and climate variations
- b. Rain
- c. Graupel and hail
- d. Sleet
- e. Freezing rain
- 3. Measuring precipitation
 - a. Rain gauges
 - b. Snow measurement
- 4. Cloud seeding and human impacts

III. Forms of Weather

20 PERCENT OF EXAM

Ch. 8, Atmospheric Circulation and Pressure Distributions

Ch. 9, Air Masses and Fronts

Ch. 10, Midlatitude Cyclones

Ch. 11, Lightning, Thunder, and Tornadoes

Ch. 12, Tropical Storms and Hurricanes

A. Distribution and movement of air

- 1. Atmospheric circulation and pressure distributions
 - a. The concept of scale and observation
 - b. The single-cell model of general circulation
 - c. The three-cell model of general circulation
 - 1) The Hadley cell
 - 2) The Ferrel and Polar cells
 - d. Semi-permanent pressure cells
 - e. The upper troposphere
 - 1) Westerly winds
 - 2) The polar front and jet streams
 - 3) Troughs and ridges
 - 4) Rossby waves
 - f. The oceans
 - 1) Ocean currents

- 2) Upwelling
- g. Major wind systems
 - 1) Monsoons
 - 2) Foehn, Chinook, and Santa Ana winds
 - 3) Katabatic winds
 - 4) Sea and land breezes
 - 5) Valley and mountain breezes
- h. Air-sea interactions in weather and climate
 - 1) El Niño, La Niña, and the Walker circulation
 - 2) Pacific decadal oscillation
 - 3) Arctic oscillation and North Atlantic oscillation
- 2. Air masses and fronts
 - a. Formation of air masses
 - 1) Source regions
 - 2) Continental polar (cP) and continental arctic (cA) air masses
 - 3) Maritime polar (mP) air masses
 - 4) Continental tropical (cT) air masses
 - 5) Maritime tropical (mT) air masses
 - b. Fronts
 - 1) Cold fronts
 - 2) Warm fronts
 - 3) Stationary fronts
 - 4) Occluded fronts
 - 5) Drylines
- 4) Movement and weather conditions
- 5) Seasonal and climatological frequencies and characteristics
- c. Processes of the middle and upper troposphere
 - 1) Rossby waves and vorticity
- d. Surface fronts and upper-level patterns
 - 1) Cold fronts and the formation of upper-level troughs
 - 2) Interaction of surface and upper-level conditions
- e. Flow patterns and large-scale weather
 - 1) Steering of midlatitude cyclones
 - 2) Migration of surface cyclones relative to Rossby waves
- f. Anticyclones
- 2. Lightning, thunder, and tornadoes
 - a. Processes of lightning formation
 - 1) Charge separation
 - 2) Runaway discharges
 - 3) Leaders, strokes, and flashes
 - 4) Types of lightning
 - 5) Thunder
 - b. Thunderstorms: air mass, multicell, and supercell
 - 1) Air mass thunderstorms
 - a) Cumulus stage
 - b) Mature stage
 - c) Dissipative stage
 - 2) Multicell and supercell storms
 - a) Mesoscale convective complexes
 - b) Squall line thunderstorms
 - c) Supercell storms
 - 3) Downbursts, derechos, microbursts, and haboobs

B. Disturbances

- 1. Midlatitude cyclones
 - a. Polar front theory
 - b. The life cycle of a midlatitude cyclone
 - 1) Cyclogenesis
 - 2) Mature cyclones
 - 3) Occlusion

- c. Geographic and temporal distribution of thunderstorms
- d. Tornadoes
 - 1) Tornado characteristics and dimensions
 - 2) Tornado formation
 - 3) Occurrence of tornadoes
 - 4) Tornado damage
 - 5) Watches and warnings
 - 6) Tornado outbreaks
 - 7) Waterspouts
- 3. Tropical storms and hurricanes
 - a. Hurricane characteristics
 - b. Hurricane structure
 - 1) The eye and the eye wall
 - c. Stages in hurricane formation
 - 1) Tropical disturbances
 - 2) Tropical depression and tropical storms
 - 3) Hurricanes
 - 4) Conditions for hurricane formation
 - d. Hurricane movement and dissipation
 - 1) Hurricane paths
 - 2) Effect of landfall
 - 3) Wind
 - 4) Heavy rain
 - 5) Tornadoes
 - 6) Storm surges
 - e. Hurricane forecasts and advisories
 - 1) Hurricane watches and warnings
 - 2) Hurricane intensity scale

IV. Human Factors

15 PERCENT OF EXAM

Appendix: Numerical Forecast Models, located at the end of Ch. 13, *Weather Forecasting and Analysis*
Ch. 14, Human Effects on the Atmosphere

A. Weather forecasting and analysis

- 1. Forecasting methods
- 2. Types of forecasting
- 3. Assessing and verifying forecasts
- 4. Data acquisition and dissemination
- 5. Forecast procedures and products
 - a. Phases in numerical modeling
 - 1) Analysis phase
 - 2) Prediction phase
 - 3) Postprocessing phase
 - b. Medium-range forecasts
 - c. Long-range forecasts and seasonal outlooks
- 6. Weather maps and images
 - a. Surface maps
 - b. Upper-level maps
 - c. Satellite images
 - d. Radar images
 - e. Thermodynamic diagrams

B. Human effects on the weather and climate

- 1. Atmospheric pollutants
 - a. Particles
 - b. Carbon dioxide
 - c. Sulfur compounds
 - d. Nitrogen oxides (NO_x)
 - e. Volatile organic compounds (hydrocarbons)
 - f. Photochemical smog
- 2. Atmospheric conditions and air pollution
- 3. Urban heat islands

V. Climate

15 PERCENT OF EXAM

Ch. 15, Earth's Climates

Ch. 16, Climate Changes: Past and Future

A. Earth's climates

1. The Koeppen system
2. Tropical climates
 - a. Tropical wet (Af)
 - b. Monsoonal (Am)
 - c. Tropical wet and dry (Aw)
3. Dry climates
 - a. Subtropical deserts (BWh)
 - b. Subtropical steppe (BSh)
 - c. Midlatitude deserts (BWk)
 - d. Midlatitude steppe (BSk)
4. Mild midlatitude climates
 - a. Mediterranean (Csa, Csb)
 - b. Humid subtropical (Cfa, Cwa)
 - c. Marine west coast (Cfb, Cfc)
5. Severe midlatitude climates
 - a. Humid continental (Dfa, Dfb, Dwa, Dwb)
 - b. Subarctic (Dfc, Dfd, Dwc, Dwd)
6. Polar climates
 - a. Tundra (ET)
 - b. Ice cap (EF)
7. Highland climates (H)

B. Climate variability and change

1. Defining climate change
2. Methods for determining past climates
 - a. Oceanic deposits
 - b. Ice cores
 - c. Remnant landforms
 - d. Past vegetation
3. Temporal and spatial scales of climate change

4. Past climates
 - a. Warm intervals and ice ages
 - b. The current ice age
 - c. The last glacial maximum
 - d. The Holocene
 - e. The last century
5. Factors involved in climate change
 - a. Variations in solar output
 - b. Changes in Earth's orbit
 - 1) Eccentricity
 - 2) Obliquity
 - 3) Precession
 - c. Changes in land configuration and surface characteristics
 - d. Changes in atmospheric turbidity
 - 1) Tropospheric aerosols
 - 2) Stratospheric aerosols
 - e. Changes in radiation-absorbing gases
 - 1) Mechanism of greenhouse warming
 - 2) Recent changes in greenhouse gases
 - f. Feedback mechanisms
 - 1) Ice-albedo feedback
 - 2) Water-vapor and cloud feedbacks
 - 3) Atmosphere-ocean interactions
 - 4) Atmosphere-biota interactions
6. General circulation models
 - a. Identifying the causes of climate change
 - b. Projecting climate change

SECTION THREE

Sample Questions

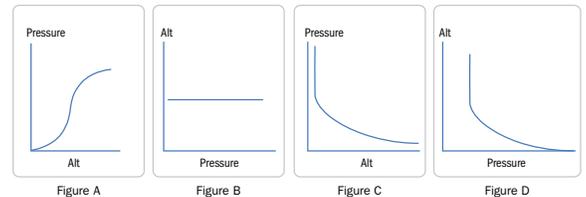
The sample questions give you an idea of the level of knowledge expected in the exam and how questions are typically phrased. They are not representative of the entire content of the exam and are not intended to serve as a practice test.

Rationales for the questions can be found on pages 20–23 of this guide. In that section, the correct answer is identified and each answer is explained. The number in parentheses at the beginning of each rationale refers to the corresponding section of the content outline. For any questions you answer incorrectly, return to that section of the content outline for further study.

You will be provided with an erasable white board to use during your exam. During your exam, a basic 8-function calculator will also be available on your computer. The calculator button is in the top left hand corner of the page as each question is presented. A typical calculator is provided at the back of this content guide.

1. Which atmospheric layer contains the most mass?
 - 1) troposphere
 - 2) mesosphere
 - 3) stratosphere
 - 4) thermosphere

2. Which graph correctly shows the relationship between altitude (Km) and atmospheric pressure in a stable climate?



- 1) Figure A
 - 2) Figure B
 - 3) Figure C
 - 4) Figure D
3. Which energy source drives Earth's atmosphere to create weather and climate?
 - 1) the difference in heat energy across latitudes
 - 2) Earth's geothermal energy source at its core
 - 3) solar radiation and its variations across latitudes
 - 4) electromagnetic radiation absorbed by Earth's surface
 4. Which pair of compounds or elements found in the atmosphere is most effective in the absorption of long wavelength radiation or heat energy?
 - 1) nitrogen and oxygen
 - 2) carbon dioxide and nitrogen
 - 3) carbon dioxide and water
 - 4) water and nitrogen

5. Which property of an air parcel will remain unchanged when pressure and temperature change?
 - 1) relative humidity
 - 2) density ratio
 - 3) mixing ratio
 - 4) dew point

6. What is the relative humidity of air that has a mixing ratio of 6 grams of water vapor per kilogram of dry air and a saturation mixing ratio of 8 grams of water vapor per kilogram of dry air?
 - 1) 20%
 - 2) 33%
 - 3) 60%
 - 4) 75%

7. What does the dew point measure?
 - 1) the temperature in a region
 - 2) the level of pollen in the atmosphere
 - 3) the amount of water in the atmosphere
 - 4) the temperature at which water vapor condenses

8. What process is defined by no loss or gain of heat?
 - 1) Bergeron process
 - 2) isothermal process
 - 3) adiabatic process
 - 4) Bessemer process

9. What is the most common mechanism for cloud formation in the atmosphere?
 - 1) upward movement of moist air
 - 2) mixing of moist air with cold air
 - 3) injection of condensation nuclei into moist air
 - 4) radiational cooling of moist air

10. What is the static stability of the atmosphere if the environmental lapse rate is negative?
 - 1) potentially stable
 - 2) absolutely stable
 - 3) conditionally unstable
 - 4) absolutely unstable

11. Which processes cause precipitation in the midlatitudes?
 - 1) convection and conduction
 - 2) collision and coalescence
 - 3) Bergeron process and drag
 - 4) riming and aggregation

12. In the winter, sleet and freezing rain are found along which fronts?
 - 1) cold fronts
 - 2) stationary fronts
 - 3) warm fronts
 - 4) occluded fronts

13. Which symbol is used to represent an occluded front?
 - 1) A
 - 2) B
 - 3) C
 - 4) D

FRONTAL SYMBOLS USED ON WEATHER MAPS

SYMBOL



- 1) A
 - 2) B
 - 3) C
 - 4) D
-
14. Which way does the wind move in the center of a low pressure system in the Northern hemisphere?
 - 1) clockwise
 - 2) counterclockwise
 - 3) stationary
 - 4) vertical

15. How are primary and secondary pollutants classified?
- 1) Primary pollutants are released into the air and secondary pollutants result from chemical reactions between primary pollutants and the surrounding atmosphere.
 - 2) Primary pollutants are similar to secondary pollutants in composition but have larger particulate matter.
 - 3) Natural occurrences of volcanic eruptions are considered as primary pollutants whereas secondary pollutants are manmade.
 - 4) Primary pollutants are found in urban areas whereas secondary pollutants are generated in rural areas from large farms.
16. Which forms of pollution affect the cardiovascular system's ability to circulate oxygen to the rest of the body?
- 1) acid deposition
 - 2) nitric oxides
 - 3) particulate matter
 - 4) carbon monoxide
17. Which two atmospheric pollutants, in the presence of sunlight, are responsible for producing photochemical smog?
- 1) carbon dioxide and sulfur dioxide
 - 2) ozone and peroxyacetyl nitrate (PAN)
 - 3) volatile organic compounds (VOCs) and nitrogen oxides (NO_x)
 - 4) smoke and fog
18. In the midlatitudes, when can the greatest amount of acid precipitation occur?
- 1) during heavy rains
 - 2) during the formation of fog
 - 3) during springtime snow melt
 - 4) at any time, as acid precipitation is constant
19. What major factors contribute to the magnitude of a heat island effect?
- 1) the size of the urban area
 - 2) the size and density of the urban area
 - 3) the density of the urban area
 - 4) the location and size of the urban area
20. What is the annual precipitation pattern of a monsoonal (Am) climate?
- 1) wet all year
 - 2) wet summer and dry winter
 - 3) dry summer and wet winter
 - 4) wet spring and fall, dry winter and summer

SECTION FOUR

Rationales

1. (IA2a)

- *1) The troposphere is where 99.9% of the atmosphere lies.
- 2) The mesosphere makes up most of the .1% of the atmosphere that remains after the troposphere is accounted for.
- 3) The stratosphere is the uppermost layer of the atmosphere.
- 4) The thermosphere is the hottest and least dense layer.

2. (IA2b)

- 1) Figure A would not represent altitude or pressure in a stable climate. It could be similar to a weather front.
- 2) Figure B is incorrect in that pressure is caused by gravitational attraction of the atmosphere to the Earth. Pressure is greater closer to the earth than 100 km above it.
- 3) Figure C may look correct, but the axis labels are reversed.
- *4) Figure D is correct in labels and line function (inverse square).

3. (IB3)

- 1) See 3).
- 2) The convection that occurs from the heat rising from Earth's core is believed to be the driving force for plate tectonics.
- *3) Differences in temperature cause high and low pressure areas, but the source of these differences is the Sun's energy heating the land and oceans differently. The different rates by which these land masses absorb and reflect the sun's energy and the rotation of the earth cause climate patterns to form and create various forms of weather.
- 4) The energy emitted by the Sun is transferred to Earth as electromagnetic radiation which contributes energy for the movement of the atmosphere, growth of plants, and evaporation of water, among other things.

4. (IB5)

- 1) Although nitrogen and oxygen are permanent gases in the atmosphere, they are not the most effective in absorbing heat energy.
- 2) Carbon dioxide is a greenhouse gas, but nitrogen is not.
- *3) Carbon dioxide and water are considered to be two of the compounds that absorb heat energy and contribute to the greenhouse effect.
- 4) Water absorbs heat energy effectively, but nitrogen is not considered to be a greenhouse gas.

*correct answer

5. (IIA3d)

- 1) Relative humidity increases as temperature decreases.
- 2) Density increases with increase in pressure and decreases with increase in temperature.
- *3) **Mixing ratio is a measure of air composition that does not change with variations in only pressure or only temperature.**
- 4) Dew point changes when pressure changes, because changing pressure also changes the ambient water vapor pressure.

6. (IIA3e)

- 1) $8 - 6 = 2$ (x 10% to be in usual range of values). Relative humidity is a ratio, not a difference.
- 2) $(8/6 - 1) \times 100\% = 33\%$. The ratio is inverted and subtracting 1 is needed to get less than 100%.
- 3) 6 is just the value of the mixing ratio (x 10% to be in the usual range of values).
- *4) $6/8 \times 100\% = 75\%$.

7. (IIA3f)

- 1) The average temperature in a region would be an isotherm.
- 2) Pollen index is the average level of pollen in the atmosphere.
- 3) Relative humidity is the percentage of water in the atmosphere.
- *4) **The average temperature at which water vapor condenses is the general definition for the term dew point.**

8. (IIA8b)

- 1) This is a cold cloud precipitation process.
- 2) In this process, temperature does not change, but heat may be exchanged.
- *3) **An adiabatic process is a process with no heat added to or removed from a substance.**
- 4) This is a process for making steel.

9. (IIB1)

- *1) **Uplift of moist air to saturation is the most common way to form clouds.**
- 2) Mixing can form clouds but that happens less commonly than by uplift.
- 3) For CN injection to cause cloud formation, air would need to be very clean and already supersaturated by another mechanism. If the air is unsaturated, adding CN may form a haze, but not a cloud.
- 4) Radiational cooling is more common as a means of forming fog. Effects of vertical motion are more important to cloud formation in the atmosphere.

10. (IIB2b)

- 1) This is not a classification of static stability, but is similar in wording to potential instability (convective instability) which is another type of stability.
- *2) **Negative lapse rate means temperature increases with altitude (an inversion).**
- 3) This applies to a lapse rate between the dry and saturated adiabatic lapse rate (both positive values).
- 4) This applies to a lapse rate greater than the dry adiabatic lapse rate of 10 K/km.

11. (IIC1b)

- 1) Convection and conduction processes are related to energy transfer.
- *2) **Collision and coalescence are defined as the main processes for which raindrops form in clouds.**
- 3) The Bergeron process is associated with cold cloud fronts and drag is the resistance that air exerts on water as it falls.
- 4) Riming and aggregation processes are associated with cold cloud formation.

*correct answer

12. (IIC2d)

- 1) Cold fronts can produce precipitation in the form of rain and snow, but the structure of the front where the colder air is below the warm air does not set conditions for sleet or freezing rain.
- 2) Stable fronts do not produce precipitation.
- *3) Warm fronts position a warm layer of air below the colder, more dense air above. This causes precipitation (ice) to melt and then partially freeze on its way to earth.
- 4) Occluded fronts cause clouds, but not freezing rain.

13. (IIIA2b)

- 1) Figure A represents a warm front.
- 2) Figure B represents a cold front.
- 3) Figure C represents a stationary front.
- *4) Figure D represents an occluded front.

14. (IIIB1e)

- 1) Low pressure regions produce counterclockwise movement of the wind.
- *2) Low pressure regions produce counterclockwise movement of the wind.
- 3) Cold and warm fronts by nature have horizontal and vertical wind associated with them.
- 4) Although fronts can have vertical air movement, low pressure areas produce a counterclockwise motion.

15. (IVB1)

- *1) Primary and secondary pollutants are defined by this statement.
- 2) Although particles can be found in primary pollutants and can be classified by size, this may or may not interact with other pollutants to produce secondary pollutants.
- 3) Volcanic eruptions do produce primary pollutants that can react with other substances in the atmosphere to produce secondary pollutants. Primary pollutants are occur both naturally and by human causes.
- 4) Pollutants, whether primary or secondary, are not limited to any one population center. Both urban and farm areas produce primary and secondary pollutants.

*correct answer

16. (IVB1)

- 1) With acid deposition, breathing may become irritated, but this does not primarily affect the body's ability to circulate oxygen.
- 2) Nitric oxides will produce acid precipitation and can interact to produce secondary pollutants, but these do not primarily affect the cardiovascular system.
- 3) Particulate matter can be an irritant and can cause health problems, but it is not directly related to the cardiovascular system or the body's ability to circulate oxygen.
- *4) CO attaches to the iron molecule of red blood cells and stops the body from releasing the carbon dioxide molecules contained in the cells. Without the transfer of carbon dioxide from the cells so it can receive the oxygen molecule, death can happen.

17. (IVB1e)

- 1) Carbon dioxide does not contribute to smog and sulfur dioxide is a pollutant that causes classical, not photochemical, smog.
- 2) Ozone and PAN are products of the photochemical reactions..
- *3) The oxidation of VOCs in the presence of NO_x and sunlight produces the components of photochemical smog.
- 4) The term smog derives from combining smoke + fog, but this refers to classical (London or sulfurous) smog. The word smog was later applied to describe the poor air quality in Los Angeles, even though the cause of the "smog" was quite different.

18. (IVB2)

- 1) Acid precipitation is found in rainfall, but can vary greatly by region and wind patterns.
- 2) Fog can be a source of acid precipitation, but tends to be a temporary condition and may have little effect in the region.
- *3) During the spring when the snow accumulated during winter melts and enters the streams, lakes, and rivers, it causes a large spike in acid concentrations. Over the winter months acid precipitation accumulates in snowbound regions and the overall concentration of acid occurs. The sudden melting releases larger amounts of stored acid in the snow.
- 4) See 3).

19. (IVB3)

- 1) The size of the urban area is a partial answer. Population density is also an important factor contributing to the magnitude of a heat island.
- *2) The size of the city and population density determine the amount of heat retained, based on structures, concrete, the number of people, and how they consume energy and release it into the atmosphere.
- 3) Population density is a partial answer. The size of the urban area is also an important factor.
- 4) Location is one factor, but population density and size contribute more to the magnitude of a heat island effect.

20. (VA2b)

- 1) This would be typical of a humid continental climate.
- *2) Monsoonal circulation produces moist on-shore flow in summer and dry off-shore flow during winter.
- 3) This is a reversed pattern from monsoonal circulation.
- 4) The monsoonal dry/wet precipitation cycle is annual, not semiannual.

*correct answer

SECTION FIVE

Taking the Exam

Registering for Your Exam

Register Online

www.excelsior.edu/examregistration

Follow the instructions and pay by Visa, MasterCard, American Express, or Discover Card.

Examination Administration

Pearson Testing Centers serve as the administrator for all Excelsior College computer-delivered exams.

Accessibility Services

Excelsior College is committed to the principle that every individual should have an equal opportunity to enroll in an Excelsior College degree program, to register for courses or examinations in order to demonstrate their knowledge and skills under appropriate conditions, and to complete a degree.

The Accessibility Services Office at Excelsior College is responsible for considering requests for reasonable accommodations for individuals with verifiable, documented disabilities. If you are requesting an accommodation due to a disability/condition, complete a [Request for Accommodation form](#).

Computer-Delivered Testing

The UExcel exams are delivered by computer. You can take this exam either in a [Pearson VUE testing center](#) or at your home or office with an online proctor. If you are interested in remote proctoring, visit [PearsonVUE OnVUE online proctoring](#).

The system is designed to be as user-friendly as possible, even for those with little or no computer

experience. On-screen instructions are similar to those you would see in a paper examination booklet. You will use either the keyboard or the mouse to submit your answers, depending upon the type of question.

Before taking your exam, we strongly encourage you to go on a virtual tour of the testing center. To access this tour, click the What to Expect in a Pearson VUE test center at the following link: home.pearsonvue.com/test-taker/security.aspx

You also will receive a small, erasable whiteboard if you need one.

Whiteboards

Examinees cannot bring scratch paper to the exam. Instead, one will be provided for you to write notes or calculations on: a small whiteboard if you are testing at a Pearson Testing Center, and an on-screen “whiteboard” if you are testing online. You can see what the [on-screen “whiteboard”](#) looks like, and even try it out.

Calculator

You may not take your own calculator, if the exam calls for it. One will be provided on the testing screen. See example below.

The screenshot displays a computer screen with a test question: "What colour is the sky on a clear day?" with radio button options: A. Blue, B. Green (selected), C. Purple, and D. Yellow. A "Calculator" button is highlighted with a yellow circle and a tooltip that says "Click to launch calculator". The calculator is a TI-108 Texas Instruments calculator interface. To the right, a "Periodic Table" and "LightAndOptics" tab are visible. The "LightAndOptics" tab contains various formulas for light and optics, such as $v = f\lambda$, $n = \frac{c}{v}$, $n_i \sin \theta_i = n_r \sin \theta_r$, $I = I_{max} \cos^2 \theta$, $f = \frac{R}{2}$, $\frac{1}{s} + \frac{1}{s'} = \frac{1}{f}$, $m = \frac{y'}{y} = -\frac{s'}{s}$, $d \sin \theta = m\lambda$, and $\sin \theta = \frac{m\lambda}{a}$.

Breaks

Breaks are only permitted for exams taken at Pearson VUE Testing Centers, and are not permitted during exams delivered via online proctoring.

Online Proctoring

As of spring 2021, Excelsior is offering an [online delivery option for UExcel exams](#), using OnVUE, Pearson VUE's online delivery and proctoring service.

You must use a personal (vs. an employer's) computer if you want to take the exam online and not in a testing center, so the exam can be effectively delivered to you.

Breaks are not allowed during an exam taken online from home. You may not leave your seat during an online-proctored exam, so be prepared to sit for two or three hours. If you need extra time, the exam will have to be taken at a PearsonVUE Testing Center, and an accommodation formally requested.

NOTE: English Composition, Spanish, Music, and College Writing will NOT be available for online proctoring.

On the Day of Your Exam

Important Reminders

On the day of your exam, remember to:

- dress comfortably: the computer will not mind that you're wearing your favorite relaxation outfit
- arrive at the test site rested and prepared to concentrate for an extended period
- allow sufficient time to travel, park, and locate the test center
- be prepared for possible variations in temperature at the test center due to weather changes or energy conservation measures
- bring your ID, but otherwise, don't weigh yourself down with belongings that will have to be kept in a locker during the test.

Academic Integrity

Nondisclosure Statement

- All examinees must agree to the terms of the Excelsior College Academic Integrity Policy before taking an examination. The agreement will be presented on screen at the Pearson VUE Testing Center before the start of your exam.
- Once the examinee agrees to the terms of the Academic Integrity Nondisclosure Agreement (NDA), the exam will begin.

If you choose not to accept the terms of the agreement

- your exam will be terminated
- you will be required to leave the testing center
- you will not be eligible for a refund. For more information, review the Student Policy Handbook at www.excelsior.edu/studentpolicyhandbook.

Student behavior is monitored during and after the exam. Electronic measures are used to monitor the security of test items and scan for illegal use of intellectual property. This monitoring includes surveillance of Internet chat rooms, websites, and other public forums.

UExcel Grade Report

After you complete the exam, you will be issued a UExcel Grade Report for Examinations. See the [sample UExcel Grade Report](#) in this content guide.

Grade Appeals

If you believe that your score grade is incorrect, you may appeal your grade to examcredit@excelsior.edu. Details about the appeals process are in the [Student Handbook](#).

What If I Miss My Appointment?

If you don't cancel or reschedule your testing appointment 24 hours before your test appointment, you will have to pay the full fee of the exam, even if you don't show up.

Late Arrivals

You will also forfeit the exam fee if you arrive to the test center more than 15 minutes late.

Information About UExcel Exams for Colleges and Universities

A committee of teaching faculty and practicing professionals determines the learning outcomes to be tested on each exam. Excelsior College Center for Educational Measurement staff oversee the technical aspects of test construction in accordance with current professional standards. To promote fairness in testing, we take special care to ensure that the language used in the exams and related materials is consistent, professional, and user friendly. Editorial staff perform systematic quantitative and qualitative reviews to ensure accuracy, clarity, and compliance with conventions of bias-free language usage.

Excelsior College, the test developer, recommends granting three (3) semester hours of lower-level undergraduate credit to students who receive a letter grade of C or higher on this examination. Other colleges and universities also recognize this exam as a basis for granting credit or advanced standing. Individual institutions set their own policies for the amount of credit awarded and the minimum acceptable score.

Weather & Climate Exam Development Committee

Thomas R. Morin, MEd
(Plymouth State University)
Atmospheric Science and Chemistry, Plymouth State
University, retired

Paul J. Croft, PhD
(Rutgers University, Meteorology and Horticulture)
Earth Science (Meteorology) Program, School of
Environmental & Life Sciences, Kean University;
Meteorologist

Robert G. Keesee, PhD
(University of Colorado, Physical Chemistry)
Atmospheric and Environmental Sciences, University
at Albany (SUNY)

Sample Grade Report

Excelsior College
GRADE REPORT FOR EXAMINATIONS

Contact ID:

Test Date: 11/21/2020

Letter Grade: C

Examination Code and Title: 210 Statistics

Recommended Credit:
3 Lower Level

Your examination results are expressed as a Letter Grade of A, B, C, or F. Your results are automatically verified when they are received at Excelsior College. If an error is detected, you will be notified immediately.

Recommended Credit is the number of semester hours credit that Excelsior College awards and recommends for your grade. Excelsior College awards and recommends credit for letter grades of C or better.

If you plan to take another examination, you may download free content guides and the User's Guide by visiting our website at www.excelsior.edu/exams/content-guides/.

If you need an Excelsior College Official Examinations Transcript to document the credit you have earned for this examination for another institution, the request can be made online by accessing the Excelsior College website (www.excelsior.edu), logging into your MyExcelsior account, and scrolling down to the For Exams Takers box and clicking on the Request transcripts link. If you do not already have a MyExcelsior username and password, you can obtain one at no cost by accessing the Excelsior College website, clicking the Log In to MyExcelsior button, and then clicking the link "Create a MyExcelsior User Account."



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