Department of Agriculture Guidance Manual



Department of Agriculture

Arthur Temple College of Forestry and Agriculture

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# Written communication

Being able to effectively communicate is a crucial skill for students graduating from college. [A report from *Inside Higher Ed*](https://www.insidehighered.com/quicktakes/2019/01/17/survey-employers-want-soft-skills-graduates) stated that 69% of employers want to hire students that are effective communicators. Additionally, the article goes on to say 74% of employers want their employees to be good listeners, and 70% want new hires to have attention to detail.

No matter what career you pursue, you will be required to write papers. Thus, we as faculty want to help you develop those skills. Writing is like a muscle. You have to use it to develop it and improve it.

## **Letter**

**Tips for Writing a Professional/Business Letter**

A **business letter** is a type of correspondence between companies or between companies and individuals, such as customers, clients, contractors or other outside parties. Business letters differ from personal letters in that they are more formal in tone and writing style. However, the tone and style can vary greatly depending on the type of business letter.

If you're sending a hard-copy business letter, you're safest if you stick to a standard, traditional format. It is suggested that you start with your own name and address -- unless it's in the letterhead -- and then the date underneath. Below that, write the recipient's name and address, then the salutation. If you send a lot of letters, you can save time by setting up a template in your computer.

Business letters serve a variety of purposes. They can be used to distribute or seek to obtain information. They can serve as apologies or for other troubleshooting strategies. Other purposes of business letters include use a as a call to action, as an introduction or as a way to seek a position within a company.

Among the most important factors to consider while writing a business letter is the reason for writing it. The purpose of the letter is important because it helps the writer properly convey the message he/she is trying to communicate.

Also, the writer should consider to whom the letter is addressed. This step makes sure that the message the writer is trying to convey reaches the appropriate individual. For example, writing a letter of apology to the wrong individual defeats the purpose of the letter.

If you're writing to someone you don't know well, such as a potential customer, keep things formal using Ms., Mr. or Dr., as appropriate. If you don't know the gender, play it safe with "Dear John Smith." If all you have is a title such as sales director, "Dear Sales Director" is acceptable. However, if you can find out the right name, that's preferable. If it's someone you've met, "Dear Pat" may be acceptable -- it's a judgment call you'll have to make.

When you're writing a business letter, keep it concise. If you have some connection -- you met at a networking event, a colleague recommended her -- you may want to bring that up. Then get to the point of the letter, which should be what's in it for the recipient. If it's a sales letter, for example, you want to bring up the advantages of buying from you. Don't approach it like an email blast, though -- even if you're sending out a dozen similar letters, make it as individual as possible.

Lastly, the writer should consider the tone to use in the letter. While all business letters should maintain a certain level of formality, the tone should be different when writing a letter to someone with whom the writer has a long-established relationship in comparison to when writing to someone the writer has never met.

**Components of business letter:**

1. Senders information (not needed if using business letterhead)

* Name
* Street address
* City, State, Zip Code
* Country (if not the same country as your recipient)
* Your phone number
* Your email

1. Today’s date
2. Addressee information

* Recipient’s name
* Job title
* Company Street Address
* City, State, Zip Code
* Country (optional)

1. Salutation

* Dear ‘last name of recipient’; – i.e. Dr. Smith, Rev. Parker, Sgt. Friday
* If exact contact person is unknown use “To Whom it May Concern”, “Members of the Hiring Committee”

1. Body (Text)

* Introduction – Explains the reason for the letter and what you want to achieve with it.
* Second paragraph – Gives more detail about your request
* Third paragraph – Optional and is included where second paragraph is not enough to explain the situation in full.
* Closing - Included one of two sentences that request the recipient to take whatever action is requested in your letter, and thanks them for reading your letter.

1. Complimentary Close – A sign-off phrase inserted before your signature

* Examples: Sincerely, Regards, Yours truly, With appreciation, Cordially.

1. Signature
2. Enclosures – Two lines below signature and indicates that other documents are included in the envelop. Think of it as the print version of “see attachment” for emails.

## **Email**

**What is Email Etiquette?**

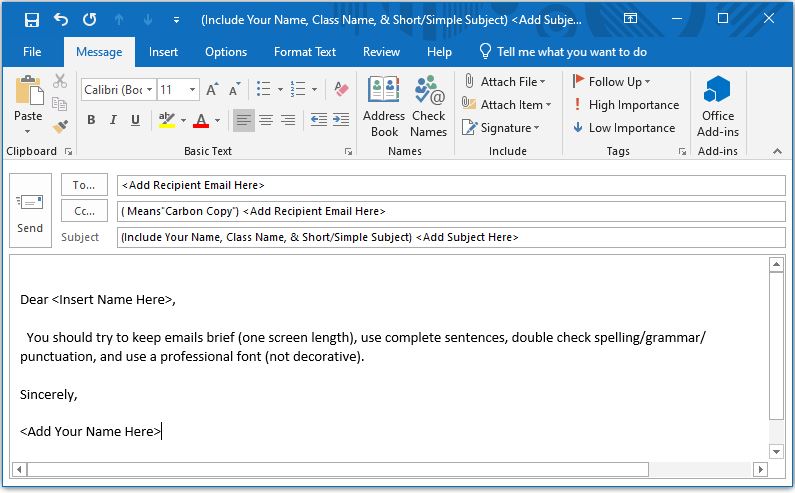
* Think of it as the ‘Code of Conduct’ for email communications.
* It refers to the principles of behavior that individuals should use when writing and answering emails.

**Why is Email Etiquette Important?**

* Emails are a form of communication. Just as you follow face to face communication norms in conversation, you should do the same in written communication.
* Larger class sizes, busy schedules, and online classes make it difficult to have in person discussions with faculty about questions and/or concerns. • You want your message to be understood in a positive manner as well as taken seriously.
* The written word can be easily misinterpreted resulting in the recipient holding a negative opinion or simply ignoring your email altogether.

**Understanding the Parts of an Email:**

* **TO**: type in the email address of the individual the message is intended for.
* **CC (Carbon Copy)**: Use this to add individuals who need a copy of the email. The original receiver of the email will see this person added.
* **BCC (Blind Carbon Copy)**: Use this when you want another individual or group of people to get a copy of the email and only they know they get a copy. The Blind means the original receiver does not know anyone else is getting a copy of this email. This may be used by a professor/instructor to provide an email to the entire class.
* **SUBJECT**: Input a clear subject line. Keep it short and simple, but not vague. Include your name, class, & what the email is specifically regarding in the subject.
* **BODY OF THE EMAIL**: Include a greeting like you would a letter, try to keep emails brief (one screen length), use complete sentences, double check spelling/grammar/ punctuation, use professional font (not decorative), & give a proper salutation that matches the message of the email (Thank you or Sincerely).



**Format:**

* Be mindful of formatting. Special characters, images, fonts, etc. may appear differently on the intended receivers end.
* Use proper structure and layout. Reading from a screen can be difficult, ensuring your email has a structure and concise layout is important. Make sure you have short paragraphs with spaces in between and use numbers or tick marks when making points.
* Watch out for run on sentences and long emails. Emails are meant to be concise and to the point not dissertations.
* Leave out the abbreviations and emoticons. The receiver may not understand or be aware of the meanings behind these two things. When in doubt, it is best to leave it out.

**Content:**

* Always read and reread your emails before sending. Double check spelling, grammar, proper titles, etc.
* Consider your content and what following up is needed. If you have multiple questions or your email is running long, consider revising your email or meeting with the receiver face to face.
* Double check your attachments. Always reference your attachment in the body of the email. Do not attach files that are very large and consider sending it as a PDF.

**Attachments:**

* Select the “Attach File” drop down menu item. Select the file to attach from the list of recent items or choose the “Browse” option to locate the file.
* Double check your attachments. Ensure your file is attached before sending the email.
* Always reference your attachment in the body of the email.
* Do not attach files that are very large and consider sending it as a PDF to reduce the size of the attachment.

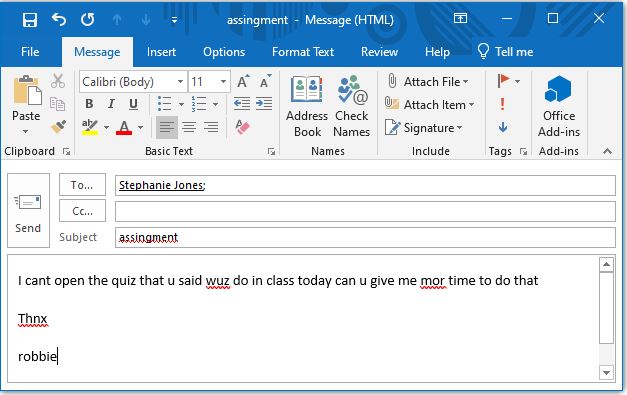
**Tone:**

* Do not email your professor asking and/or complaining about grades. If you have inquiries, schedule an appointment to meet in person to review areas of improvement.
* Think about the impression your tone will make in the email. If you are emotionally charged, it is best to wait 24 hours before emailing or responding to emails.
* Allow the proper amount of response time. This applies to both the sender & receiver. The rule of thumb is 24 hours. If no response occurs after that, you can follow up.

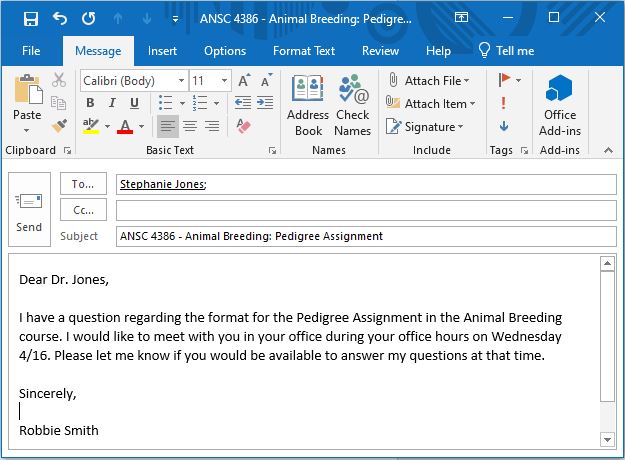
**Other Email Tips:**

* Do not write in all CAPITALS. This makes it seem that you are shouting at the receiver.
* Treat faculty (and other students) with respect. Refrain from bad mouthing or calling unnecessary attention to situations. *Golden rule*- treat those how you want to be treated.
* Professors/instructors may respond during normal work hours; therefore, have reasonable expectations for response to your email.

**Bad Email Example:**



**Good Email Example:**



**Memorandum (memo):** A memo is a brief technical document that addresses a specific subject. Memos are often used by industry, university, and state and federal agency employees to communicate both within their organization and between organizations.

**Components of a memo**

Unlike a formal business letter, a memo does not include a salutation or the sender’s signature. A memo format typically includes the following sections:

**Heading**

The word *”Memo”* or *”Memorandum”* appears to make it clear that the message is being communicated through a memo.

**Recipient**

This section identifies the recipients. For example, if you are writing a memo to all the employees of the marketing department, it should say. For example, “*To:* *Agriculture students.”*

**Sender**

This section specifies the name, designation and department of the person writing the memo. For example, *”From: Franta Majs, Ph.D.”*

**CC or additional recipients**

These are the recipients whom you do not directly address in the *To* section but to whom you send a copy of the memo for the sake of information. For example, “*CC: Agriculture faculty”.*

**Date**

All memos must invariably include the date of writing the memo.

**Subject line**

The subject line gives the recipients a quick idea about the content of the memo. It should be brief and precise. For example, *”Subject: The Pathways internship and employment opportunities.”*

**Message body**

This section states the message in one, two or three short paragraphs. The body should first state the purpose of writing the memo, then move on to the message. If the content of this section is long, you may also want to include a summary of the message. The message should conclude with a clear call-to-action, i.e., what action the recipients are expected to take.

**Attachments (optional)**

**Example memorandum:**

Memorandum

To: Agriculture students

From: Franta Majs, PhD

CC: Agriculture faculty

Date: 9/15/2021

Subject: **The Pathways internship and employment opportunities**

The Pathways Program offers federal internship and employment opportunities to students or recent graduates majoring in Agriculture.

The USDA-Farm Production and Conservation (FPAC) Mission Area will be announcing hundreds of Pathways opportunities next month (October 2021). The FPAC agencies include the Natural Resources Conservation Service (NRCS); Farm Services Agency; Risk Management Agency and the FPAC Business Center. The announcements for individual agencies will open throughout October 2021. Applications are accepted only through www.USAjobs.gov and can be searched by the agency, job series, and geographic location. The application window is extremely short, usually only 5 days, and can close early, if the ceiling number of applicants is reached. Preparing a competitive application for the Pathways opportunity takes time, but the experience is usually rewarding. An internship counts as an existing federal work experience, which in future opens employment opportunities reserved for “transfer” applicants as well. To apply a student needs transcript (unofficial is sufficient for internship) and detailed résumé. Résumé must include among other information the student’s GPA, applicable coursework with unit/credit hours, any work and volunteer experience including dates, pay rate/salary and supervisor name, and contact information for references. Each hiring agency makes individual compensation decisions and the announcement on www.USAjobs.gov lists the compensation. The General Schedule (GS) specifies the educational criteria for hourly pay rate. Minimum and maximum pay rate within each GS is set by step-1 and step-10, respectively. The pay rate is adjusted based on the cost of living and overtime is paid at 1.5× of the adjusted rate.

Table X-x: General schedule (GS) for hourly positions at the Natural Resources Conservation Service.

|  |  |  |  |
| --- | --- | --- | --- |
| Schedule | Educational requirement | Step 1 | Step 10 |
| GS-1 | Enrollment in an approved high school, home schooled, or GED | $9.36 | $11.71 |
| GS-2 | High school diploma or equivalent | $10.53 | $13.25 |
| GS-3 | Completion of 1 full academic year of post-high school study | $11.49 | $14.93 |
| GS-4 | Completion of 2 full academic years of post-high school study or associate's degree | $12.90 | $16.76 |
| GS-5 | Completion of all requirements for a bachelor’s degree or equivalent | $14.43 | $18.76 |
| GS-7 | Completion of 1 full academic year of graduate level education or eligibility under the Superior Academic Achievement Provision after completing a bachelor’s degree | $17.87 | $23.23 |
| GS-9 | Completion of all requirements for a master’s degree or equivalent | $21.86 | $28.42 |

## **Literature reviews / Research reports**

**WRITING LITERATURE REVIEWS / RESEARCH REPORTS**

Writing a literature review / research paper

1. Format for a literature review: A literature review follows an essay format (Introduction, Body, Conclusion/summary), but if the literature itself is the topic of the essay, your essay will need to consider the literature in terms of the key topics/themes you are examining.
2. Steps in writing literature review / research paper

* Literature search: Quality references can be found by searching ‘Google Scholar’ and data bases via the library. For agriculture ‘AGRICOLA’ is a good data base.
* Find the literature
* Read the literature – taking notes
* Decide on the order of presentation: In most cases, this would be from most important to least important.
* Write review: Start with the Body, then Conclusion / Summary and finally Introduction.
* Proofread and edit carefully

**Paper Logistics**

Your papers have these following requirements.

* Cover page: Title, name of each author of the paper, affiliation of each author, course number and name, instructor name, assignment due date, page number. (See sample title page below).
* On page two, your text should start at the very top of the page.
* Then, provide your literature cited at the end.
* One page of written text is considered one full page. Therefore, two pages with some text at the top on page three is NOT a three page paper. It is a two page paper with a couple of sentences.
* Your paper should be double spaced, with 12 pt font, and have 1 inch margins
* You must use in-text citations in your paper to help your readers follow along.
* [Need help with writing? Check out SFA’s Online Writing Lab!](http://www.sfasu.edu/aarc/help-with-writing)

**Reputable Sources**

As a student you need to be able to recognize a reputable source. Reputable sources are published, significant, and relevant sources accessible through a library or an information system. These include journal articles, books, theses, dissertations, proceedings, bulletins, reports, and published abstracts of papers presented at meetings. Also, reputable trade websites are acceptable. If you are unsure, you can always check with your professor.

**Plagiarism**

Plagiarism is the act of stealing and passing off the ideas or words of another as one's own. Students can plagiarize by either directly copying and pasting words from a source into their work OR not appropriately citing the source of their information. Information usually has in-text citations following the information. These in-text citations are important because they help readers follow the origin of your thought, and they give credit where credit is due.

**In-text Citations**

In-text citations are important when writing because they help readers find the source of the information quickly. The in-text citations then coordinate with sources listed in the literature cited at the end of the paper. They are also short instead of having to cite an entire long citation. While some people use footnotes and numbers, this system allows readers to quickly understand what authors and work a writer is pulling information from.

The style for listing literature citations is APA with the last name(s) of the author(s) and the year of the publication cited in the text

* One author: (Jones, 1998)
* Two authors: (Jones and Smith, 1998
* Three or more authors (Jones et al., 1998). The phrase et al. means “and others”

List in text citations alphabetically (letter by letter, not word by word) by last names of authors (then initials if last names are the same) and chronologically if duplicate author names appear to support a statement, e.g. (Jones, 1998, 2000; Kader, 2001; Smith, 1996).

All citations mentioned in the text must be included in the Literature Cited.

For any sentences or statements between two citations, it is understood that the latter citation is the source of the material.

**Literature Cited**

The literature cited is listed at the end of the paper to provide readers a way of finding the source of information. With the literature cited, you can actually follow the development of ideas over time since each work cites the work that came before it. Also, we have ways of writing sources correctly so that it is standardized and easy to find. For any references not listed below, you may use APA format for citing, and you don’t have to list the page number.

**Literature Cited Requirements**

* The reference section should include only published, significant, and relevant sources accessible through a library or an information system (see reputable sources section above). These include journal articles, books, theses, dissertations, proceedings, bulletins, reports, published abstracts of papers presented at meetings, and reputable trade websites for crops.
* Just like for the in-text citations, all references listed in the Literature Cited must be mentioned somewhere in the text.

**Each item in the literature cited should include author names, date, titles, publisher, volume, and pages. Electronic citations are covered below.**

**Literature Cited: Author Names**

* All authors of a reference must be listed. Authors are listed first by senior author (last name first, followed by initials) and then additional authors (initials first, then last name).
* List in-text citations alphabetically (letter by letter not word by word) by last names of authors (then initials if last names are the same) and chronologically if duplicate author names appear. Example:
  + Jones, B.F., T.C. Wesson, and J.E. Smith. 1998a. Hollies. Wiley, New York.
  + Jones, B.F., Z.C. Wesson, and J.E. Smith. 1998b. Holly berries. Wiley, New York.
* If a name is followed by “Jr.” or a Roman numeral, the correct form is “Smith, Jr., B.F.,” or “Smith, II., B.F.
* Names of foreign authors retain their native spellings and diacritical marks.
* If a work has no author, give the name of the publisher or the organization (committee, agency, etc.) responsible for the work.
* If an editor or editors is given, their names are followed by “(ed.)” or “(eds.),” respectively, followed by a period.

**Literature Cited: Date**

* Following the name(s) of the author(s), give the year of publication (the copyright or publication date listed on the publication, not the actual release date), followed by a period. If no year is given, indicate no date—for example, n.d.
* If more than one work by the same author or set of authors is cited, list the publications in chronological order and, if the year is also identical, insert lowercase letters (in alphabetical sequence) after the date, according to the order in which they are cited in the text.
* All single authored articles of a given individual precede multiple-authored articles of which that individual is senior author.

**Literature Cited: Titles**

* Titles should be lowercase except for the first word, proper names, or certain foreign-language conventions.
* Do not italicize titles except for words or phrases italicized in the title of the published work.
* Do not use quotation marks around titles. If an article, book, or chapter title has a subtitle (indicated by a dash, colon, semicolon, smaller type, or different typeface), place a colon before the subtitle and capitalize the first letter of the first word.
* Never abbreviate titles.
* Titles of foreign publications retain their native spelling and diacritical marks.
* When giving the name of a publisher, write John Wiley & Sons, Inc. OR Macmillan Publishing Co. instead of abbreviating them John Wiley or Macmillan.
* Include the location of the publisher. When more than one location is listed for a publisher, give only the first one.

**Literature Cited: Volume and Pages**

* Give the volume number in Arabic numerals, followed by the issue number (if available) in Arabic numerals in parentheses.
* Issue numbers are only necessary if the publication’s pages are renumbered from 1 with each issue within a volume.
* The pagination of the publication follows, connected to the volume number and/or issue number by a colon, and all closed up (no spaces): 96(5):645–648.
* Give full pagination, e.g., use “1101–1102,” not “1101–2” or “1101–02.”
* Supply the abstract number or university microfilm number for dissertations available from Dissertation Abstracts or on microfilm.

**Electronic Citations for Literature Cited**

Electronic citations should follow the recommended minimum format as follows.

1) Name of author, editor, compiler, or translator of the source.

2) Year of electronic publication, latest update, or posting.

3) Title.

4) Date (day, month, year) author accessed the source.

5) Complete electronic address.

**DOI for Literature Cited**

A DOI (Digital Object Identifier) is a unique and never-changing string assigned to [online](https://www.scribbr.com/citing-sources/cite-a-website/) (journal) [articles](https://www.scribbr.com/citing-sources/cite-a-journal-article/), [books](https://www.scribbr.com/citing-sources/cite-a-book/), and other works. DOIs make it easier to retrieve works, which is why citation styles, like [APA](https://www.scribbr.com/citing-sources/what-is-a-doi/#apa) and [MLA Style](https://www.scribbr.com/citing-sources/what-is-a-doi/#mla), recommend including them in citations.

You may find DOIs formatted in various ways:

* doi:10.1080/02626667.2018.1560449
* https://doi.org/10.1111/hex.12487
* https://dx.doi.org/10.1080/02626667.2018.1560449
* https://doi.org/10.1016/j.jpsychires.2017.11.014

Sample title page

Title of Paper

Author(s) name(s)

Department of Agriculture

Arthur Temple College of Forestry and Agriculture

Stephen F. Austin State University

Course number and name (AGRI 33xx: Agriculture and Natural Resources)

Instructors name (Dr. John Doe)

Date due in month, day, and year (August 23, 2021)

**Specific examples of citations**

Commonly used citations. Note punctuation and abbreviation in each case. The APA list 114 different types of citations.

**ABSTRACT**

Krischnamurti, G. S. R., and Huang, P. M. 1991, October. The role of Al in Fe(II) transformation. In Abstracts, Annual Meeting, Clay Mineral Society (p. 96). Clay Mineral Society.

Nesmith, W.C. and W.M. Dowler. 1973. Cold hardiness of peach trees as affected by certain cultural practices. HortScience 8(3):267 (abstr.).

**BOOK**

AOAC. 1990. Official methods of analysis. 15th ed. Assoc. Off. Anal. Chem., Arlington, VA.

Snedecor, G. W. and W.G. Cochran. 1989. Statistical methods (8th ed.). Iowa State University Press.

Hartmann, H.T., D.E. Kester, and F.T. Davies, Jr. 1990. Plant propagation principles and practices. 5th ed. Prentice Hall, Englewood Cliffs, N.J.

**BOOK CHAPTER**

Brown B, and M. Aaron. 2001. The politics of nature. In: Smith J (ed) The rise of modern genomics, 3rd ed. Wiley, New York, pp 230-257

Gardner, W. H. 1986. Water content. In A. Klute (Ed.), Methods of soil analysis: Part 1. Physical and mineralogical methods (2nd ed., pp. 493–544). ASA and SSSA.

Brown, A.G. 1995. Apples, p. 3–37. In: J. Janick and J.N. Moore (eds.). Advances in fruit breeding. Purdue Univ. Press, West Lafayette, Ind.

**BULLETIN**

Andresen, J., C. N. Layman, J. E. Doll, and M. Baranski. 2012. Climate basics. MSU Extension Bulletin E-3151., Michigan State University, East Lansing, Michigan, USA.

Millar, N., J. E. Doll, and G. P. Robertson. 2014. Management of nitrogen fertilizer to reduce nitrous oxide (N2O) emissions from field crops. MSU Extension Bulletin E3152. Michigan State University, East Lansing, Michigan.

**ELECTRONIC CITATION**

Casey, D.  2010.  Sequencing technologies.*Primer on molecular genetics from the U. S. Department of Energy.*  Retrieved from [**http://www.ornl.gov/hgmis/publicat/primer/intro.html**](http://www.ornl.gov/hgmis/publicat/primer/intro.html)

State of California. 2002. California Code of Regulations, Title 3. Food and

Agriculture. Office of Administrative Law, Sacramento. 10 July 2002. Retrieved from http://ccr.oal. ca.gov/

**PERIODICAL**

Bordoli, J. M., and A.P. Mallarino. 1998. Deep and shallow banding of phosphorous and potassium as alternatives to broadcast fertilization for no-till corn. Agronomy Journal, 90, 27–33.

Perez, V. G., A. M. Waguespark, T. D. Bidner, L. L. Southern, T. M. Fakler, T. L. Ward, M. Steidinger, and J. E. Pettigrew. 2011. Additivity of effects from dietary copper and zinc on growth performance and fecal microbiotia of pigs after weaning. J. Anim. Sci. 89:414–425. doi:10.2527/jas.2010-2839.

**PROCEEDINGS**

Wilkinson, D. (Ed.). 1993. Proceedings of the 49th Annual Corn and Sorghum Industry Research Conference. American Seed Trade Association.

Bailey, E. A., J. R. Jaeger, J. W. Waggoner, G. W. Preedy, L. A. Pacheco, and K. C. Olson. 2012. Effect of weaning method on welfare and performance of beef calves during receiving. Proc. West. Sec. Amer. Soc. Anim. Sci. 63:25-29.

**PROCEEDINGS PAPER**

Duckworth, A. L., A. Quirk, R. Gallop, R.H. Hoyle, D.R. Kelly, and M.D. Matthews, 2019. Cognitive and noncognitive predictors of success. *Proceedings of the National Academy of Sciences*, *USA*, *116*(47), 23499– 23504. <https://doi.org/10.1073/pnas.1910510116>

Locascio, S.J., J.G.A. Fiskell, and P.E. Everett. 2000. Advances in watermelon

fertility. Proc. Trop. Reg. Amer. Soc. Hort. Sci. 14:223–231.

**REPORTS**

U.S. Department of Agriculture. 1997. Agricultural statistics for 1996. U.S. Dept.

Agr., Washington, D.C.

U.S. Department of the Interior. 2016. *Agency financial report FY 2016.*https://www.doi.gov/sites/doi.gov/files/uploads/doi\_fy\_2016\_afr.pdf

**THESIS OR DISSERTATION**

Christianson, L. E. (2011). Design and performance of denitrification bioreactors for agricultural drainage [Doctoral dissertation, Iowa State University]. Iowa State University Digital Repository. <https://lib.dr.iastate.edu/etd/10326>

Reeder, J.D. 2001. Nitrogen transformations in revegetated coal spoils. Colo. State Univ., Fort Collins, PhD Diss. Abstr. 81-26447.

## **Tables**

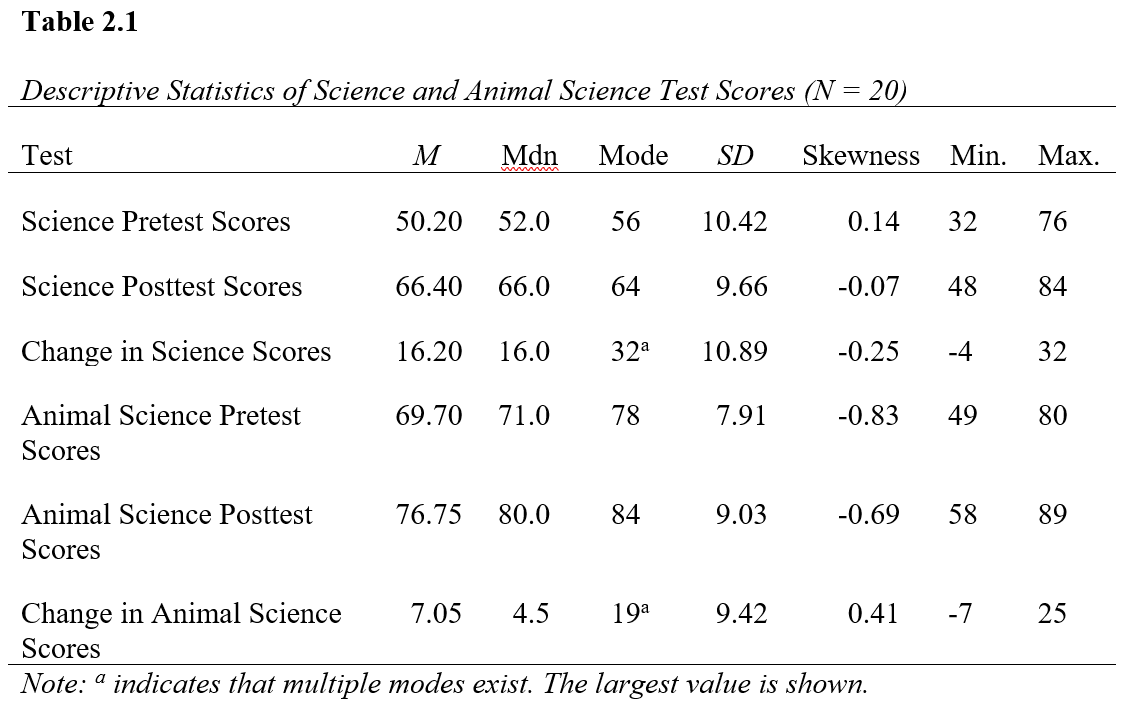
**Guidelines for Presenting Data in Tables**

When using both a narrative and a table, the narrative should come first in the manuscript and be followed by the table. The narrative should only tell the most pertinent aspects of the table instead of all details. If the narrative tells all details of the table then there is no need for the table. The narrative can also reference the table and use data from the table to support narrative claims. Sometimes journals and professors require that tables be included at the end of the paper, if they do not specify this then include the tables within the text immediately following the paragraph in which the table was referenced.

When creating a table, you should use guidelines which include the following basic guidelines

* Use the 3-line rule – your table should not have any vertical lines, only horizontal lines, one on top of the column headings, one on bottom of the column headings, and one after the last line of data (See Table 2.1 for an example).
* The table should use all space from left to right margin
* Use appropriate column headings and be consistent (if you abbreviate one heading abbreviate all headings)
* The table number (in our example it is Table 2.1 because it is the first table in chapter 2) should appear above the title in bold print.
* Provide a descriptive title for the table. The title should be:
* Flush left
* *Italicized* (or underlined)
* *First letter of each word is capitalized*
* Include sample size in parenthesis after title (if used to communicate research)
* Double space content
* Arrange variable statistics from high to low (unless there is a reason to present in another manner, in our example it made more sense to list them according to the test given)
* Be consistent in reporting values (i.e. # of decimal points, for example if you use 2 decimal points on a number in a column is 2 decimal points on all numbers in that column)
* First column is flush left, other columns are centered (always center numbers on the decimal)
* Notes can be included under the last line of data (below the line) to further describe contents in table if they cannot be understood from the contents of table (you do not always have to use a note). Notes should be double-spaced, flush left, and italicized.
* Tables should not be split on multiple pages if they will fit on one page. If the table is longer than one page, make the headings repeat on each page. If a table is too wide to fit on one page, use the landscape orientation on the page with the wide table.

Example:



## **Figures**

All types of visual displays other than tables are considered figures. Common types of figures include graphs, charts, drawings, maps, plots, photographs infographics and other illustrations.

The standards for good figures are simplicity, clarity, continuity, and information value.

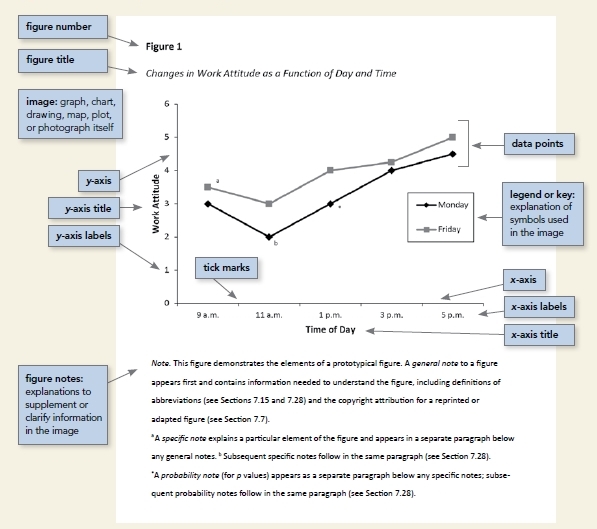
When creating a figure, ensure you meet the following standards:

* Images are clear
* Lines are smooth and sharp
* Font is legible and simple
* Units of measurement are provided
* Axis are clearly labeled
* Elements within the figure are clearly labeled or explained

Figure Components (basic)

* Number: The figure number appears above the figure in bold.
* Title: The figure title appears one double-space line below the figure number in italic tile case. (some journals the title may be in-line with the figure number)
* Image: The image portion of the figure is the chart, graph, photograph, drawing, or other illustration itself.
* Legend: A figure legend, or key, if present, should be positioned within the borders of the figure and explains any symbols used in the figure image.
* Note: Three types of notes (general, specific and probability) can appear below the figure to escribe contents of the figure that cannot be understood from the figure title, image, and/or legend alone. Not all figures include figure notes.

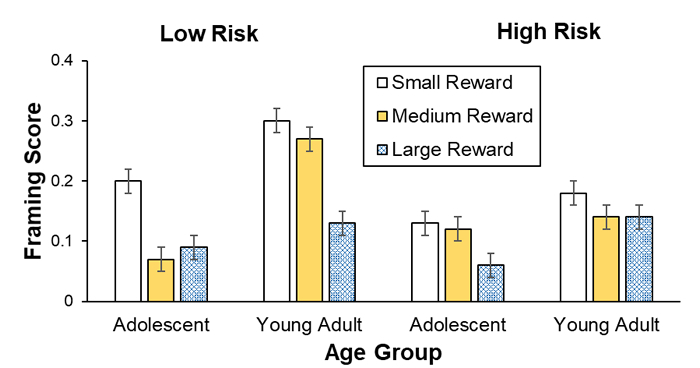
Figure placement: There are two options for the placement of figures in a paper. The first (preferred) is embed figures in the text after each is first mentioned; the second is to place each figure on a separates page after the reference list. An embedded figure may take up an entire page; if the figure is short, however, text may appear on the same page as the figure. In that case place the figure at either the top of bottom of the page rather than in the middle. Also add one blank double-spaced line between the figure and any text to improve the visual presentation.



Sample bar graph

**Figure 1**

*Framing Scores for Different Reward Sizes*

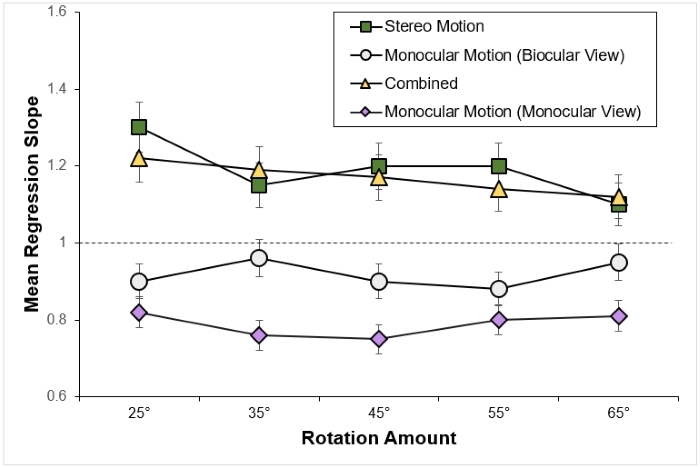


*Note*. Framing scores of adolescents and young adults are shown for low and high risks and for small, medium, and large rewards (error bars show standard errors).

Sample line graph

**Figure 3**

*Mean Regression Slopes in Experiment 1*

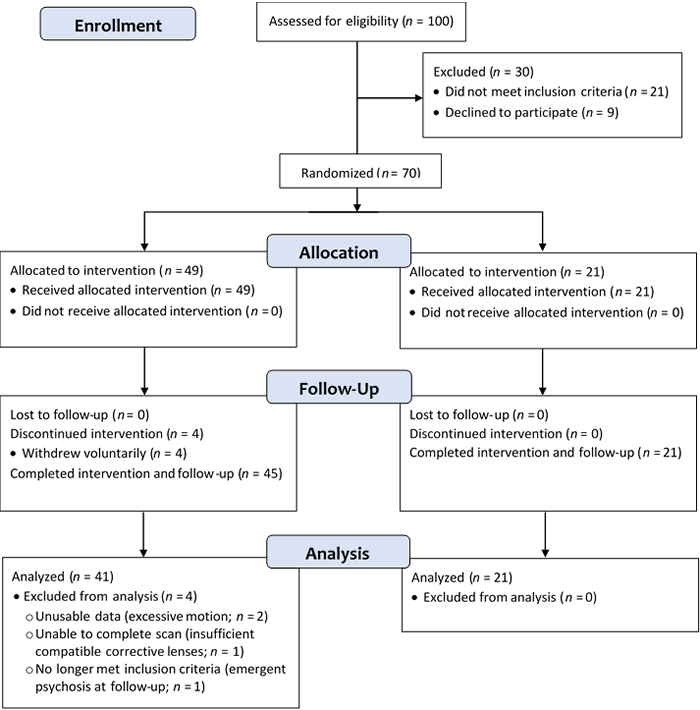


*Note*. Mean regression slopes in Experiment 1 are shown for the stereo motion, biocularly viewed monocular motion, combined, and monocularly viewed monocular motion conditions, plotted by rotation amount. Error bars represent standard errors. From “Large Continuous Perspective Change With Noncoplanar Points Enables Accurate Slant Perception,” by X. M. Wang, M. Lind, and G. P. Bingham, 2018, *Journal of Experimental Psychology: Human Perception and Performance*, *44*(10), p. 1513 (<https://doi.org/10.1037/xhp0000553>). Copyright 2018 by the American Psychological Association.

Sample flowchart

**Figure 2**

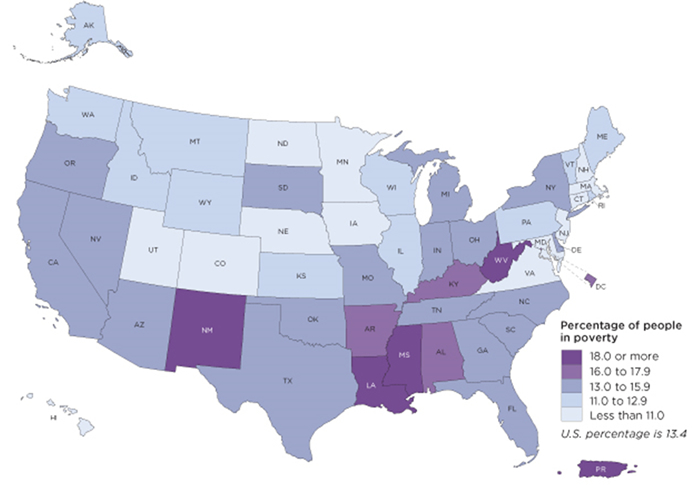
*Flowchart of Participants*



Sample map

**Figure 1**

*Poverty Rate in the United States, 2017*



*Note.* The map does not include data for Puerto Rico. Adapted from *2017 Poverty Rate in the United States*, by U.S. Census Bureau, 2017 (<https://www.census.gov/library/visualizations/2018/comm/acs-poverty-map.html>). In the public domain.

# Units of Measure and Dimensional Analysis

1. **Importance**
2. **Mars Probe Lost Due to Simple Math Error**

By Robert Lee Hotz

Oct. 1, 1999 12AM PT

Science writer for Los Angeles Times

“NASA lost its $125-million Mars Climate Orbiter because spacecraft engineers failed to convert from English to metric measurements when exchanging vital data before the craft was launched, space agency officials said Thursday. A navigation team at the Jet Propulsion Laboratory used the metric system of millimeters and meters in its calculations, while Lockheed Martin Astronautics in Denver, which designed and built the spacecraft, provided crucial acceleration data in the English system of inches, feet and pounds. As a result, JPL engineers mistook acceleration readings measured in English units of pound-seconds for a metric measure of force called newton-seconds. In a sense, the spacecraft was lost in translation.”

1. **Homeowner Receives Liming Recommendation in Incorrect Units**

A customer received a correctly calculated liming recommendation for his lawn. The units on a report form for lawn are pounds per 1000 sq ft. Unfortunately, the recommendation was reported on an incorrect form which used the default units of tons per acre. In conclusion, 40 pounds per 1000 sq ft and 40 tons per acre represent two very different quantities of lime!

1. **Purpose**
2. Become comfortable with the common units of measure used in the US
   1. The International System of Units (SI) aka ‘Metric’ system
      1. Contains both base units (Table X-1x) and derived units (Table X-2x)
      2. Most use regular 10-base and common prefixes (Table X-3x)
   2. The United States Customary System (USCS) aka ‘Standard’ system
      1. Uses irregular base (Tables X-4x – X-7x)
3. Become proficient in conversion of units using the Dimensional Analysis method.
   1. Practice the large number notation and significant figures rules
   2. The conversion is easier within the SI system, due to regular 10-base
4. Forty Fun Facts and Formulas for Fortitude
5. **Selected units**

**Table X-1x:** The seven SI base units (NIST, 2021).

|  |  |  |
| --- | --- | --- |
| **Quantity** | **Unit** | **Symbol** |
| Temperature | kelvin | K |
| Time | second | s |
| Length | meter | m |
| Mass | kilogram | kg |
| Amount of substance | mole | mol |
| Electric current | ampere | A |
| Luminous intensity | candela | cd |

**Table X-2x:**  Selected derived SI units with special names.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Derived quantity** | **Derived unit** | **Symbol** | **SI units** | **Base SI units** |
| Absorbed dose | gray | Gy | J kg–1 | m2 s–1 |
| Activity (of a radionuclide) | becquerel | Bq |  | s–1 |
| Capacitance | farad | F | C V–1 | m−2 kg−1 s4 A2 |
| Celsius temperature | degree Celsius | °C |  | K |
| Dose equivalent | sievert | Sv | J kg–1 | m2 s–2 |
| Electric charge | coulomb | C |  | s A |
| Electric conductance | siemens | S | A V–1 | m−2 kg−1 s3 A2 |
| Electric potential | volt | V | W A–1 | m2 kg s−3 A−1 |
| Electric resistance | ohm | Ω | V A–1 | m2 kg s−3 A−2 |
| Energy, work | joule | J | Nm | m2 kg s−2 |
| Force | newton | N |  | m kg s−2 |
| Frequency | hertz | H |  | s–1 |
| Illuminance | lux | lx | cd sr |  |
| Inductance | henry | H | Wb A−1 | m2 kg s−2 A−2 |
| Magnetic flux | weber | Wb | V s | m2 kg s−2 A−1 |
| Magnetic flux density | tesla | T | Wb m−2 | kg s−2 A−1 |
| Plane angle | radian | rad |  | m m–1 |
| Power, radiant flux | watt | W | J s–1 | m2 kg s–3 |
| Pressure, stress | pascal | Pa | N m–2 | kg m–1 s–2 |
| Solid angle | steradian | sr |  | m2 m–2 |

**Table X-3x:** List of SI prefixes with the most common prefixes emphasized in **bold font**.

|  |  |  |
| --- | --- | --- |
| **Order of magnitude** | **Prefix** | **Symbol** |
| 1024 | yotta | Y |
| 1021 | zetta | Z |
| 1018 | exa | E |
| 1015 | peta | P |
| 1012 | tera | T |
| 109 | giga | G |
| **106** | **mega** | **M** |
| **103** | **kilo** | **k** |
| **102** | **hecto** | **h** |
| **101** | **deka** | **da** |
| **Order of magnitude** | **Prefix** | **Symbol** |
| **10–1** | **deci** | **d** |
| **10–2** | **centi** | **c** |
| **10–3** | **milli** | **m** |
| **10–6** | **micro** | **µ** |
| **10–9** | **nano** | **n** |
| 10–12 | pico | p |
| 10–15 | femto | f |
| 10–18 | atto | a |
| 10–21 | zepto | z |
| 10–24 | yocto | y |

**Table X-4x:** Common USCS length and survey units; 1 inch = 25.4 mm.

|  |  |  |
| --- | --- | --- |
| **Unit** | **Symbol** | **Divisions** |
| mile | mi | 1760 yd |
| yard | yd | 3 ft |
| US foot\* | ft | 12 in |
| inch | in | 6 P |
| pica | P | 12 p |
| point | p |  |

|  |  |  |
| --- | --- | --- |
| **Unit** (survey) | **Symbol** | **Divisions** |
| league | lea | 3 mi |
| survey mile | mi | 8 fur |
| furlong | fur | 10 ch |
| chain | ch | 4 rd |
| rod\* | rd | 25 li or 16.5 ft |
| link | li | 7.92 in |

\*In some states US foot and US survey foot are different. This difference (2 ppm) is of no practical implications over distances <1 mi.

**Table X-5x:** Common USCS area units.

|  |  |  |
| --- | --- | --- |
| **Unit** | **Symbol** | **Divisions** |
| survey township | twp | 36 sections or 4 sq lea |
| section |  | 640 ac or 1 sq mi |
| acre | ac | (220 yd × 22 yd) or 10 sq ch or 43,560 sq ft |
| square chain | sq ch | 4356 sq ft or 16 sq rd |
| square foot | sq ft | 144 sq in |

**Table X-6x:** Common USCS volume units.

|  |  |  |
| --- | --- | --- |
| **Unit** (liquid) | **Symbol** | **Divisions** |
| Barrel\*\* | bbl | 31.5 to 42 gal |
| US gallon | gal | 4 qt or 231 cu in |
| US quart | qt | 2 pt |
| US pint | pt | 2 c |
| US cup | c | 8 fl oz |
| US fluid ounce | fl oz | 2 tbsp |
| tablespoon | tbsp | 3 tsp |
| teaspoon | tsp | 80 min |
| US fluid dram | fl dr | 60 min |
| Minim | min |  |

|  |  |  |
| --- | --- | --- |
| **Unit** (dry) | **Symbol** | **Divisions** |
| Barrel\*\* | bbl |  |
| Bushel | bu | 4 pk |
| Peck | pk | 2 gal |
| Gallon | gal | 4 qt |
| Quart | qt | 2 pt |
| Pint | pt |  |

\*\*Numerous barrel volumes have been used in the U.S., often determined by the contents.

**Table X-7x:** Common USCS Avoirdupois mass units.

|  |  |  |
| --- | --- | --- |
| **Unit** (dry) | **Symbol** | **Divisions** |
| long ton |  | 2240 lb |
| ton (short ton) | t | 2000 lb |
| US hundredweight | cwt | 100 lb |
| pound | lb | 16 oz |
| Ounce | oz | 16 dr |
| Dram | dr | 2711/32 gr |
| Grain | gr | 1/7000 lb |

1. **Dimensional analysis**

* Large number notation
  + 10 = 1×101 or 250 = 2.5×102 or 0.1 = 1×10–1 or 0.0034 = 3.4×10–3
  + The use of the notation with decimal, i.e.10, base is advantageous because
    - Multiplication of the numbers is preceded by ADDITION of the exponents,
    - Division of the numbers is preceded by SUBTRACTION of the exponents,
    - Raising to a power is MULTIPLICATION of the exponents.
* Significant figures
  + Three rules to determine the number of significant figures
    - Non-zero digits are always significant.
    - Any zeros between two significant digits are significant.
    - Trailing zeros are significant only in numbers with decimal point.
  + Addition and subtraction
    - Count the number of significant figures in the decimal portion of each number in the problem.
    - Add or subtract numbers in the normal fashion.
    - The FINAL answer may have no more significant figures to the right of the decimal point than the LEAST number of significant figures in any number in the problem. Normal rules for rounding up/down apply.
    - Example: 12.4 + 0.124 = 12.5
  + Multiplication and division
    - The LEAST number of significant figures in any number of the problem determines the number of significant figures in the FINAL answer. Normal rules for rounding up/down apply.
    - Example: 2.201 × 5.0 = 11

1. **Temperature** (Table X-1x)
   1. SI
      * K and °C
   2. USCS
      * °F
   3. Between SI and USCS
2. **Time:** Apart from second (s) other units are also acceptable (Table X-1x)
   * day, hr, min
3. **Length** (Tables X-1x, 3x, 4x)
   1. SI
      1. km, m, mm, µm, nm – with conversion step 1000×
      2. dm, cm – with conversion step 10×
   2. USCS
      * mi, yd, ft, in – with assorted conversion steps
   3. Between SI and USCS
      * Exact conversion factor 1 in = 25.4 mm
4. **Area** (Tables X-1x, 3x, 4x, 5x)
   1. SI
      1. Square versions of everything in (3a)
      2. ha = 100 m × 100 m = 10,000 m2
   2. USCS
      1. Square versions of everything in (3b)
      2. ac = 22 yd × 220 yd = 4,840 sq yd
   3. Between SI and USCS
      * Exact conversion factor 1 in = 25.4 mm
5. **Volume** (Tables X-1x, 3x, 4x, 6x)
   1. SI
      1. Cubic versions of everything in (3a)
      2. 1 dm3 = 1 L, 1 cm3 = 1 mL
   2. USCS
      1. Cubic versions of everything in (3b)
      2. cu yd, cu ft, cu in
      3. gal, qt, pt, fl oz
      4. acre-inch = ac × in,
      5. acre-furrow-slice (afs) = 1 ac × 6.7 in = 24,321 cu ft
   3. Between SI and USCS
      * Exact conversion factor 1 in = 25.4 mm
6. **Mass** (Tables X-1x, 3x, 7x)
   1. SI
      * Mg, kg, g, mg, µg – with conversion step 1000×
   2. USCS
      * t, lb, oz – with assorted steps
   3. Between SI and USCS
      * Approximate conversion factor 1 kg = 2.2 lb
7. **Amount of substance** (Tables X-1x, 3x, 7x)
   * Standard atomic weight (see Periodic Table), molar mass, percentage
8. **Density** (Tables X-1x, 3x, 6x, 7x)
   1. Any combination of (6a) over (5a)
      * Especially focus on g cm–3 and Mg m–3
   2. Any combination of (6b) over (5b)
      * Especially focus on ~2×103 lb afs–1
   3. Between SI and USCS
      1. Exact conversion factor 1 in = 25.4 mm
      2. Approximate conversion factor 1 kg = 2.2 lb
9. **Pressure** (Tables X-1x, 2x, 3x)
   1. SI and other metric units
      1. Pa, bar, cm of H2O
      2. Exact conversion factor 100,000 Pa = 1 bar
      3. Approximate conversion factor 1 cm H2O = 98.0665 Pa
   2. USCS and other
      1. Pound per square inch (psi), Torr, standard atmosphere (atm)
      2. Approximate conversion factors
         1. 1 atm = 14.6959 psi,
         2. 1 atm=760 Torr,
   3. Between SI and USCS
      * 1. 1 atm=101.325 kPa,
        2. 1 atm=1033 cm H2O
        3. 1 psi= 6.894757 kPa
10. **Examples**
11. **Temperature**
    1. SI
       * 273.15 K = 0°C
    2. USCS
       * 273.15 K = 32°F
    3. Between SI and USCS units
       * 100°C = ?°F
       * –40°F = ?°C
12. **Time**
    * 7.11 hr = ? s
13. **Length**
    1. SI
       * 1 km = ? m
       * 250,000 nm = ? mm
       * 80 mm = ? dm
    2. USCS
       * 2.5 mi = ? yd
       * 3,888 in = ? yd
    3. Between SI and USCS units, 1 in = 25.4 mm exactly!
       * 2 ft = ? dm
14. **Area**
    1. SI, definition of hectare: 1 ha = 100 m × 100 m = 10,000 m2 or 104 m2
       * 2.47 ha = ? m2
       * 78,600 mm2 = ? dm2
    2. USCS, definition of acre: 1 ac = 22 yd × 220 yd = 4,840 yd2
       * 5,694 sq in = ? sq yd
    3. Between SI and USCS units, 1 in = 2.54 cm exactly!
       * 2.47 ac = ? ha
15. **Volume**
    1. SI, 1 dm3 = 1 L
       * 1 cm3 = ? mL
       * 350,000 mL = ? m3
16. USCS
    * + 1.2 gal = ? fl oz
      + 6.00 ft3 = ? gal
      + 1 acre-inch = ? ft3
      + acre-furrow-slice (afs) = 1 ac × 6.7 in = ? cu ft
17. Between SI and USCS units
    * + 850 cm3 = ? cu ft
18. **Mass**
    1. SI
       * 675,000,000 mg = ? Mg
19. USCS
    * + 0.02 t = ? oz
20. Between SI and USCS units, 1 kg = 2.2 lb approximately
    * + 850.0 lb = ? Mg
21. **Chemical composition** 
    * + Molar mass = sum of atomic weights in g mol–1

K2SO4 = 2 × 39.0983 + 32.066 + 4 × 15.9994 = 174.26 g mol–1

* + - How much K is in K2SO4?
    - How much K2O is in K2SO4?
      * Molar mass of K2O

K2O = 2 × 39.0983 + 15.9994 = 94.1906 g mol–1

* + - * K in K2O
      * K2O in K2SO4
    - How much N is in NH4NO3?

NH4NO3 = 2 × 14.00674 + 4 × 1.00794 + 3 × 15.9994 = 80.04344 g mol–1

1. **Density**
   1. SI
      * Particle density of quartz (SiO2): 2.65 g cm–3 = ? Mg m–3
2. USCS
   * Density of gasoline at 20°C: 6.25 lb gal–1 = ? lb ft–3
3. Between SI and USCS units
   * + Density of water at 4°C: 1 g cm–3 = ? lb ft–3
   * Bulk density of concrete: 150 lb ft–3 = ? kg m–3
4. **Pressure**
   1. SI and other metric units
      * 10,000,200 Pa = ? MPa
      * Matric potential of soil -0.330 bar = ? cm H2O at 4°C
   2. USCS and other non-metric units
      * The only units required will be pounds per square inch or PSI
   3. Between SI and USCS
      * 30 psi = ? Pa,
        + First convert USCS units to their SI equivalents and then
        + Multiply by the gravitational constant, g (green).
          - Please note 6 sig. figures on g and the answer.
5. **Forty Fun Facts and Formulas for Fortitude**
   * + 1. 1 acre = 43,560 ft²
       2. 1 mile = 5,280 ft
       3. 1 rod = 16.5 ft
       4. 1 mile = 320 rods
       5. 1 yd³ = (3 ft)3 = 27 ft³
       6. 1 ft³ = 1728 in³
       7. 1 ft² = 144 in²
       8. 1 board-feet, bd-ft = 144 in³; bd-ft = (thickness, in × width, in × length, ft) ÷ 12
       9. 1 gallon, gal = 231 in³
       10. 1 ton = 2,000 lb
       11. Work, ft-lb = force, lb × distance, ft
       12. Power, lb-ft/min = (force, lb × distance, ft) ÷ time, min
       13. Torque, lb-ft = force, lb, × length of lever, ft; torque can be converted from lb-ft to lb-in by dividing by 12
       14. Horsepower = (power, lb-ft ÷ time, min) ÷ 33,000 or (power, lb-ft ÷ time, hr) ÷ 550
       15. 1 gallon of water weighs about 8 pounds; 1 gallon of diesel fuel weighs about 7 pounds; 1 gallon of gasoline weighs about 6 pounds
       16. Square or rectangular concrete foundation volume, yd³ = (length, ft × width, ft × thickness, ft) ÷ 27
       17. Area of square, rectangle, or parallelogram = length × width
       18. Area of triangle when length of base and height are known = (length of base × height) ÷ 2
       19. Area of triangle when length of three side are known = √S(S-a)(S-b)(S-c), where S = (a + b + c) ÷ 2 and a, b, and c – lengths of three sides
       20. Area of a triangle when two sides and their included angle are known = (b × c × sin Φ), where b and c are known sides and Φ – angle between sides a and b
       21. Area of circle = πr², where r – radius
       22. Circumference of circle = πd, where d – diameter
       23. Area of trapezoid = h × (a + b) ÷ 2, where h – height or distance between parallel sides, a and b – lengths of two parallel sides
       24. Sector (a slice of a circle) when the radius and angle are known = (πr² × Φ) ÷ 360, where r – radius, Φ – included angle of sector
       25. Sector when the radius and arc length are known = (r × arc length) ÷ 2, where r – radius
       26. Cylinder volume = πr² × l, where r – radius, l – length of cylinder or stroke of piston; for piston type internal combustion engines, engine stroke is used for length
       27. Engine displacement = cylinder volume × number of cylinders
       28. Ohm’s Law states that E = I × R or I = E ÷ R or R = E ÷ I, where E – electromotive force or pressure, measured in volts, I – current, measured in amperes, R – resistance, measured in Ohms and often abbreviated Ω
       29. 1 acre-ft = 43,560 ft³
       30. 1 acre-in = 6,272,640 in³ = 27,154 gallons = 217,232 pounds
       31. Barbed wire rolls = 80 rods = 1320 ft = 1/4 mile
       32. Roofs and roofing are measured in units called squares; 1 square = 100 ft²
       33. A bundle of wooden shingles contains approximately 1/4 square or 25 ft²
       34. Electrical power is measured in units of watts or kilowatts; Watts = amperes × volts if there are no coils (inductance) in the circuit(s)
       35. Electrical energy is bought and sold in units of kilowatt hours; 1 kWh is, or is equivalent to, 1,000 watts used for 1 hour
       36. Electric power bill = watts used ÷ 1000 × hours of use × price/kWh
       37. Sine = opposite side ÷ hypotenuse; opposite side = sine × hypotenuse; hypotenuse = opposite side ÷ sine
       38. Theoretical field capacity, ac./hr. = machine speed, mph × machine width, ft
       39. Actual field capacity, ac./hr. = machine speed, mph, × machine width, ft × efficiency
       40. Hydraulic force, lb = pressure, psi × area, in²; pressure, psi = force, lb ÷ area, in²; area, in² = force, lb ÷ pressure, psi

# Career development

## Internships

**Importance**

The goal of a college education is to gain skills and competencies in order to make the student a marketable employee upon graduation. An important aspect of gaining these skills is participation in the field while you obtain your degree. The best way to do so is through internships within the industry. With that in mind, how would one go about obtaining an internship:

* **What is your degree:** You must have an understanding of what jobs are conducive to individuals with this degree.
* **What experience do you already have:** If you work on a university farm center, you may look at a position with a company doing similar tasks.
* **What skills will I gain from the experience:** Will the internship expand my knowledge base and skillset for my student organizations, job, and future career.
* **What are your interests:** Do not waste time working in an area that will not benefit the skills you are gaining with your degree just to check the box.
* **You can do more than one:** Students can participate in an internship any time during your college career and can build as you gain knowledge. You may find an opportunity within a company that you never knew existed before your internship.

**How do I find them?**

* Visit job websites or businesses
* Use college career center
* Ask professors/departmental resources
* Social media (Instagram, Facebook, LinkedIn)

**How do I apply?**

* Resume
* Cover Letter
* Social media profiles
* Online portfolio
* Phone interview
* Face-to-face interview

Student internships, especially in agriculture, are not always glamorous jobs! It is acceptable and expected for students to be willing to work and learn in any circumstance. A positive attitude in all working conditions and situations will benefit any student. Internships are the best way to discover what jobs you may love and what jobs you may never want to do again. It is also important to remember participation in a bachelor’s program does not elevate your standing above any type of activity or serviceable skill.

## Resume Building Tips

Resumes are brief documents that showcase your skills, education and professional background. Typically, resumes will contain your name and contact info, education, professional summary, work experience, skills and additional experience. If you are not sure how to produce one, [use a template](https://www.glassdoor.com/blog/13-irresistible-resume-templates-to-download-now/). DO NOT SUBMIT A RESUME WITHOUT A REVIEW FROM A FACULTY MEMBER OR CAREER CENTER!

Steps for producing your resume:

* Use the STAR format — situation, task, action and result — in your work experience bullet points
* [Quantify your impact](https://www.glassdoor.com/blog/resume-metrics/) whenever possible
* List your key wins and accomplishments, not just your day-to-day tasks
* Highlight meaningful extracurriculars & awards
* Emphasize skills & responsibilities found in the [job description](https://www.glassdoor.com/blog/guide/how-to-read-a-job-description/)
* While it may be all the experience you have, do not overemphasize high school experience unless it is relevant to the position
* Do not use complete sentences
* Create a professional email address
* **Keep it clean, concise & easy-to-read**

Sample resume

# Agriculture Glossary

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**A**

**Abiotic –** Any nonliving component of an ecosystem.

**Abrasion –** A scraped spot or area; the result of rubbing or abrading.

**Absorb –** To take up or receive by chemical or molecular action.

**Accident –** An undesirable or unfortunate happening that occurs unintentionally and usually results in harm, injury, damage, or loss; casualty; mishap.

**Accumulation –** Growth by continuous additions.

**Accuracy –** The ability of a measurement to match the actual value of the quantity being measured.

**Acid –** A substance containing hydrogen that dissociates to form hydrogen ions when dissolved in water; any substance with a pH less than 7.0.

**Acidity –** The measure of how many hydrogen ions a solution contains.

**Acre –** A unit of land measurement in England and the United States that is 43,560 square feet.

**Addition –** Process of soil deposited due to erosion.

**Adenine –** One of the four bases in DNA. It pairs only with thymine.

**Aeration –** The process of being supplied with air.

**Agar –** A gelatin-like product of certain seaweeds, used for solidifying certain culture media.

**Aggression –** Behavior that is meant to intimidate or injure an animal of the same species or of a competing species but is not predatory.

**Agribusiness –** A term referring to the full scale of operations related to the business of agriculture. It connotes the interrelationships of farming, farm services, soil science, agronomy, land grant universities, county extension services, state and federal experiment stations, soil and water conservation services, plant and animal nutrition, plant and animal protection, transportation, finance, and marketing.

**Agricultural mechanics –** Design, operation, maintenance, service, selling, and use of power units, machinery, equipment, structures, and utilities in agriscience.

**Agriculture –** The broad industry engaged in the production of plants and animals for food and fiber, the provision of agricultural supplies and services, and the processing, marketing, and distribution of agricultural products.

**Agriscience –** The application of scientific principles and new technologies to agriculture.

**Agronomy –** The specialization of agriculture concerned with the theory and practice of field-crop production and soil management.

**Alkalinity –** The measure of how many hydroxyl ions a solution contains.

**Alternative energy –** Energy, as solar, wind, or nuclear energy, that can replace or supplement traditional fossil-fuel sources, as coal, oil, and natural gas.

**Altitude –** The height of anything above a given planetary reference plane, esp. above sea level on earth.

**Amendment –** A motion used to change another motion to clarify, add, or remove a part of the original motion.

**Amino acid –** Organic substance from which organisms build proteins, or the end product of protein decomposition.

**Ampere (amp, A) –** a measure of the rate of current in a conductor.

**Anatomy –** The branch of biology that deals with the structure of organisms.

**Anther –** The saclike part of the stamen on seed-producing plants that develops and contains the pollen.

**Aquatic –** Living in water.

**Aquifer –** A geologic formation or structure that transmits water in a sufficient quantity to supply the needs for a water development.

**Aroma –** An odor detected by the olfactory sense.

**Articulation –** Division into clear and distinct words or syllables.

**Artificial monuments –** Government markers or posts used as a point or a starting point when using the metes and bounds means of defining land boundaries.

**Atmosphere –** The gaseous envelope surrounding the earth.

**Attitude –** A manner, disposition, feeling, or position with regard to a person or thing; tendency or orientation.

**B**

**Bacteria –** Single-celled microorganisms; some cause human, animal, or plant diseases; others are beneficial.

**Balance –** The skeletal and muscular makeup of an animal, which gives the animal visual appeal. The body parts of a well-balanced animal appear to fit together and blend harmoniously and symmetrically.

**Barrow –** A male pig castrated before sexual maturity.

**Base –** A substance that gives off hydroxyl ions when dissolved in water; any substance with a pH above 7.0.

**Base temperature –** The lowest temperature where metabolic processes result in a net substance gain in aboveground biomass.

**Baselines –** East and west survey lines that are 24 miles apart that intersect with the meridian.

**Bedrock –** Unweathered hard rock that lies directly beneath the soil layers or beneath superficial geological deposits, such as glacial drift.

**Beef –** The meat derived from cattle.

**Behavior –** The actions or reactions of a person or animal in response to external or internal stimuli.

**Bill of materials –** A listing of materials with specifications that are needed in a project.

**Biodiesel –** A fuel made primarily from oily plants (such as the soybean or oil palm) and to a lesser extent from other oily sources (such as waste cooking fat from restaurant deep-frying).

**Biofuel –** Fuel produced from renewable resources, especially plant biomass, vegetable oils, and treated municipal and industrial wastes.

**Biomass –** The amount of matter of biological origin in a given area.

**Biome –** A geographic area characterized by specific kinds of plants and animals.

**Biotic –** A living component of an ecosystem.

**Bitch –** A female dog, fox, wolf, or other canine.

**Boar –** A male pig that has not been castrated.

**Body language –** A non-verbal way one communicates.

**Bone –** A piece of the skeleton of a vertebrate.

**Bovine –** An animal of the family *Bovidae*; a cow, bull, steer, calf or ox.

**Bromthymol blue –** A dye used as an acid-base indicator.

**Buck –** A male sheep, rabbit, deer, or antelope.

**Buffer –** A substance in soil, such as organic matter, clay, carbonates or phosphates, which resist changes of pH of soil.

**Buffering capacity of soil –** The ability of a soil to resist a change in its hydrogen-ion concentration.

**Bull –** An uncastrated male bovine.

**C**

**Calf –** The young of certain large mammals including bovine animals.

**Calorie –** A quantity of food capable of producing such an amount of energy.

**Calyx –** Group of sepals on a flower.

**Canine –** A member of the dog family; includes dogs, wolves, foxes, jackals, etc.

**Cannon –** That portion of an animal’s leg, ankle, or pastern from the knee to the fetlock in the front legs or the hock to the fetlock, ankle, or pastern in the rear legs.

**Capacity –** Amount of body volume.

**Capon –** A cockerel castrated to fatten it for the market.

**Caprine –** Of or pertaining to goats.

**Carbohydrate –** Any of certain organic chemical compounds of carbon, hydrogen, and oxygen, which include sugars and starches. Formed in plants by photosynthesis, carbohydrates make up a large part of animal feed.

**Career –** A person’s occupation or profession.

**Career cluster –** A group of occupations, industries, and majors with common knowledge and skills.

**Career Development Event (CDE)** **–** A CDE is an event where students apply skills related to specific areas of the agricultural industry.

**Career pathway –** Small groups of occupations within a career cluster.

**Carnivore –** A consumer that eats other consumers.

**Castrate –** To remove the testicles or destroy their use.

**Casual –** Without ceremony or formality; relaxed or informal.

**Caution –** Alertness and prudence in a hazardous situation; care; wariness.

**Cecum –** In humans and animals, the closed sac which is the beginning of the large intestine.

**Cell membrane –** The semipermeable membrane enclosing the cytoplasm of a cell.

**Cell wall –** The membranous covering of a cell secreted by the cytoplasm in growing plants.

**Cells –** The ultimate functional unit of an organic structure, plant, or animal. It consists of a microscopic mass of protoplasm, which includes a nucleus surrounded by a membrane.

**Cellulose –** An inert, complex carbohydrate which makes up the bulk of cell walls of plants.

**Cellulosic ethanol –** Ethyl alcohol derived from cellulose.

**Centimeter (cm)** **–** One 100th of a meter, equivalent to 0.3937 inch.

**Centriole –** A structure that appears during mitosis in animal cells.

**Centrosome –** A dark body containing a centriole in animal cells, but not plant cells; spindle fibers radiate from the centrosome in preparation for mitosis.

**Chart –** A sheet exhibiting information in a table or systematic arrangement of columns and rows.

**Chick –** A young chicken.

**Chlorophyll –** A substance present in all green plants; it evidences itself as the green coloring in leaves. Chlorophyll transforms light energy from the sun into chemical energy for the manufacture of plant food from carbon dioxide, water, and essential soil minerals. This process is called photosynthesis.

**Chloroplasts –** Minute objects within plant cells that contain the green pigment, chlorophyll.

**Chromosome –** A microscopic, dark-staining body, visible in the nucleus of the cell at the time of nuclear division, which carries the genes, arranged in linear order. Its number in any species is usually constant, and it serves as the bridge of inheritance, i.e., the sole connecting link between two succeeding generations.

**Circulation –** The pulsatory movement of blood in the body.

**Clarity –** Clearness of appearance.

**Classification –** The forming, sorting, apportioning, grouping, or dividing of objects into classes to form an ordered arrangement of items having a defined range of characteristics.

**Classify –** To arrange or organize a group by reason of common attributes, characteristics, qualities, or traits.

**Clay –** A size term denoting particles, regardless of mineral composition, with diameter less than 2 µm.

**Clear title –** No legal claims against the ownership of the property.

**Climate –** The sum total of all atmospheric or meteorological influences, principally temperature, moisture, wind, pressure, and evaporation, which combine to characterize a region and give it individuality by influencing the nature of its landforms, soils, vegetation, and land use.

**Coal –** A readily combustible mineral containing more than 50 percent by weight and more than 70 percent by volume of carbonaceous material.

**Cockerel –** A male chicken less than one year old.

**Colic –** A pain in the abdomen caused by irregular muscular contractions, obstruction, spasm, or distension of the viscera.

**Colt –** A young male horse, ass, or mule under four years of age.

**Combustion –** The act or process of burning.

**Commodity –** Any unprocessed or partially processed good, such as a grain, fruit, vegetable, or metal.

**Communicate –** To express thoughts, feelings, or information easily or effectively.

**Communication –** The process of sending and receiving messages in which two or more people achieve understanding.

**Compaction –** Decrease in volume of sediments, as a result of compressive stress, usually resulting from continued deposition above them.

**Complete flower –** A flower containing sepals, petals, stamens, and at least one pistil.

**Concept map –** A type of diagram that shows various relationships between concepts.

**Condensation –** The process of turning a vapor into a liquid.

**Condition –** The degree or amount of fat on a breeding animal.

**Conductivity –** The ability or power to conduct or transmit electricity.

**Conflict –** To come into collision or disagreement; be contradictory.

**Confluence –** The point where two streams meet.

**Conformation –** The type, form, and shape of the live animal, usually with reference to some performance characteristic.

**Conservation –** The use of a natural resource in such a way as to minimize waste and maintain the resource in as good a condition as is practical.

**Consumer –** 1) A person who uses a product. 2) An organism, usually an animal that feeds on plants or other animals.

**Contaminant –** An undesirable substance that is present, but is not intentionally added.

**Control –** In an experiment, a group or individual that serves as a standard of comparison with another group or individual to which one test factor is applied.

**Corolla –** Collectively, all of the petals of the flower.

**Cow –** The mature, female bovine.

**Creed –** Philosophy statement.

**Criteria –** A standard of judgment or criticism; a rule or principle for evaluating or testing something.

**Crop –** Any product of the soil. In a narrow sense, the product of a harvest obtained by labor, as distinguished from natural production or wild growth.

**Cytoplasm –** The living substance within a plant or animal cell excluding the nucleus.

**Cytosine –** One of the four bases of DNA; it pairs only with guanine.

**Cytoskeleton –** A network of long protein strands in the cytosol that helps maintain the shape and size of a eukaryotic cell.

**Cytosol –** The gelatin-like aqueous fluid that bathes the organelles on the inside of the cell membrane.

**D**

**Dairy –** Pertaining to that which is related to the production, processing, or distribution of milk and its products.

**Danger –** Liability or exposure to harm or injury; risk; peril.

**Data –** Pieces of information, as facts, statistics, or codes; an item of data.

**Debate –** To engage in argument or discussion.

**Deciduous –** Pertaining to woody plants whose leaves fall at the end of the growing season.

**Deficiency –** An insufficiency in reference to amount, volume, proportion, et cetera; a lack.

**Density –** The mass per unit of volume.

**Deoxyribonucleic acid (DNA) –** A genetic protein-like nucleic acid on plant and animal genes and chromosomes that controls inheritance. Each DNA molecule consists of two strands in the shape of a double helix.

**Deposition –** The addition of sediment, as by flowing water.

**Desert –** An area where rainfall averages less than 25 cm per year.

**Design –** To prepare the preliminary sketch or the plans for (a work to be executed), esp. to plan the form and structure of.

**Diagnosis –** The process of identifying a disease by examination and study of its symptoms.

**Dichotomous key –** A key for the identification of organisms based on a series of choices between alternative characters.

**Diesel –** A combustible petroleum distillate used as fuel for diesel engines.

**Diet –** The type and amount of food habitually ingested by a person or an animal.

**Digestion –** The changes that food undergoes within the digestive tract to prepare it for absorption and use in the body.

**Dilemma –** Any difficult or perplexing situation or problem.

**Dimension –** Measurement of length, width, or thickness.

**Dimension line –** Solid line with arrowheads at the ends to indicate the length, width, or height of an object or part.

**Dissolved oxygen –** The amount of oxygen present in water in a dissolved state.

**Distance –** The amount of space between two things, points, lines, etc.

**Doe –** A female goat, rabbit, or deer.

**Drawing –** A picture or likeness made with a pencil, pen, chalk, crayon, or other instrument.

**E**

**Ecology –** The study of the relationship between organisms and their environment.

**Ecosystem –** All the biotic and abiotic components of an environment.

**Electrocute –** To kill by electricity.

**Elevation –** Height above sea level or height above any selected base point.

**Embryo –** Any organism in its earliest stages of development.

**Emergency –** A sudden, urgent, usually unexpected occurrence or occasion requiring immediate action.

**Emphasis –** Special and significant stress of voice laid on particular words or syllables.

**Employability skills –** Employability skills or soft skills are non-technical skills that are necessary for an employee to have in order to be successful in the workforce. A few examples of employability skills are listening, speaking, group participation, and problem solving.

**Endocrine –** An internal secretion; hormone.

**Energy –** The capacity to do work.

**Energy pyramid –** A depiction of the amount of energy in each trophic level of an ecosystem.

**English system –** A system of measure based on measurements on common objects.

**Entrepreneurship SAE –** An enterprise that is conducted by a student as the owner or manager of a business based on agriscience and is supervised by a teacher.

**Environment –** The sum total of all the external conditions that may act upon an organism or community to influence its development or existence.

**Equine –** Pertaining to, or resembling, a horse or other member of the family *Equidae*.

**Erosion –** The group of processes whereby earthy or rock material is worn away, loosened, or dissolved and removed from any part of the earth’s surface.

**Essential nutrient –** One of sixteen elements required for plant growth. Essential nutrients are necessary for a plant to complete its life cycle.

**Ethanol –** Ethyl alcohol; most commonly derived by fermentation of plant materials; used as a fuel substitute/replacement for petroleum based fuels.

**Ethics –** A system of moral principles.

**Eukaryote cell –** A cell that contains genetic information or DNA in the nucleus like most organisms.

**Evaluate –** To examine and judge carefully.

**Evaluation –** To examine and judge carefully; appraise.

**Evaporation –** The changing of a liquid into a gas.

**Ewe –** A female sheep of any age.

**Experiment –** A test, trial, or tentative procedure; an act or operation for the purpose of discovering something unknown or of testing a principle or supposition.

**Exploratory SAE –** A program that allows a student to become involved in learning a variety of subjects about agriscience and careers related to agriculture.

**Exponential –** Rising or expanding at a steady and usually rapid rate.

**Export –** To ship (merchandise, commodities, workers, etc.) to a foreign country for use, sale, processing, or services.

**Expression –** Indication of feeling, spirit, character, et cetera, as on the face or in the voice.

**Extinguish –** To put out (a fire or light); put out the flame of something burning or lighted.

**F**

**Fat –** Any food product: e.g., lard or vegetable shortening, which is derived from animal or vegetable fats.

**Fauna –** The total wild animal life of an area in the broadest sense, including wild animals, birds, fish, reptiles, insects, and smaller animal life.

**Feed –** Harvested forage, such as hay, silage, fodder, grain, or other processed feed for livestock.

**Feedstuff –** One or a mixture of the substances that form the nutrients; namely, proteins, carbohydrates, fats, vitamins, minerals, and water. A feedstuff is different from a feed in that a feedstuff is not normally fed by itself but is mixed with other feedstuffs to formulate a feed. For example, soybean meal or fishmeal.

**Feline –** Belonging or pertaining to the cat family, *Felidae*.

**Fermentation –** A chemical reaction in which a ferment causes an organic molecule to split into simpler substances.

**Fertilization –** The uniting of pollen and ovule cells.

**FFA –** A national youth organization for students interested in agriculture. The official name is the National FFA Organization. In 1988, the National FFA Organization changed its original name of Future Farmers of America to reflect the expanding career field of Agricultural Education.

**Fiber –** A fine, threadlike piece, such as cotton or wool.

**Field –** 1. An expanse of open or cleared ground, esp. a piece of land suitable or used for pasture or tillage. 2. A sphere of activity or interest within a particular business or profession.

**Filament –** The part of the stamen of a flower that is below the anther and supports it.

**Filly –** A young immature female horse.

**Filtration –** The act or process of separating a solid from a liquid.

**Finish –** The degree of fatness. This term is often used interchangeably with condition but as finish, the fat should lay smoothly over the body in a proper degree to suit the market.

**Fire extinguisher –** A portable container, usually filled with special chemicals for putting out a fire.

**Fire triangle –** The three conditions, fuel, heat, and oxygen, that must be present to produce a fire.

**Flexitarian –** One who normally maintains a vegetarian diet but occasionally makes exceptions and eats meat or fish.

**Flora –** The aggregate of plants that grow without cultivation in a given area within a stated period of time.

**Floriculture –** The cultivation of plants for their flowers.

**Flower –** The reproductive structure of a seed-bearing plant, consisting of the male and/or female organs that are surrounded by one or two series of outer coverings.

**Foal –** The unweaned young of the horse or mule.

**Food –** Anything which when taken into the body, nourishes the tissues and supplies body heat.

**Food chain –** Pathway beginning with producers along which energy is transferred from trophic level to trophic level.

**Food science** – The study of the nature of foods and the changes that occur in them naturally and as a result of handling and processing.

**Food web –** The interconnected food chains in an ecosystem.

**Foodborne illness –** Disease caused by agents that enter the body through the ingestion of food.

**Foot –** A unit of linear measurement; 12 inches. Plural, feet.

**Forest –** A plant association predominantly of trees and other woody vegetation that occupies an extensive area of land.

**Fossil fuel –** A deposit of organic material containing stored solar energy that can be used as fuel. The most important are coal, natural gas, and oil.

**Fraction –** A ratio of algebraic quantities similarly expressed.

**Freezing –** In relation to water, changing from a liquid to a solid.

**Fruit –** Mature ovary, seed.

**Fuel –** Any material that will burn.

**G**

**Gasoline –** A volatile, flammable liquid mixture of hydrocarbons, obtained from petroleum, and used as fuel for internal-combustion engines, as a solvent, et cetera.

**Gelding –** A castrated male horse.

**Genes –** The simplest unit of inheritance. Physically, each gene is apparently a nucleic acid with a unique structure. It influences certain traits.

**Geographic Information System (GIS) –** Computer application that integrates information with geographic data.

**Geothermal energy –** Energy taken from heat sources underground, often in volcanically active areas.

**Germination –** Sprouting of a seed, and beginning of plant growth.

**Germination rate –** Percentage of seeds that sprout and begin to grow.

**Gib –** A castrated cat.

**Gilt –** A name for a young female pig until it produces its first offspring, when it becomes a sow.

**Global Positioning System (GPS) –** A network of satellites launched and controlled by the Department of Defense. It is designed to help determine latitude, longitude, altitude, and time.

**Goal –** The end toward which effort is directed.

**Golgi apparatus –** A system of membranes in eukaryotic cells that modifies proteins for export by the cell.

**Government agency –** An administrative unit of government.

**GPS receiver –** Collects radio waves from various satellites to determine location and time.

**Graph –** A diagram representing a system of connections or interrelations among two or more things by a number of distinctive dots, lines, or bars.

**Grassland –** A region in which the vegetation is mainly grass or other herbaceous plants. Climate conditions are intermediate between those of forest regions and of deserts.

**Gravel –** Accumulation of water-worn pebbles larger than two millimeters in diameter.

**Ground cover –** Any vegetation that grows close to the ground, producing protection for the soil.

**Groundwater –** Water within the earth that supplies wells and springs.

**Group –** A collection of people.

**Growing degree unit (GDU) –** Used to estimate the growth and development of plants and insects during the growing season.

**Growth –** An irreversible increase in volume and/or weight.

**Guanine –** One of the four bases of DNA; it pairs only with cytosine.

**H**

**Handling –** Manipulation necessary to care for animals.

**Hardpan –** A dense, compacted layer of soil under the surface that may interfere with the downward penetration of both roots and water.

**Hardware –** The mechanical equipment necessary for conducting an activity, usually distinguished from the theory and design that make the activity possible.

**Harvest –** To cut, reap, pick, or gather any crop or product of value.

**Hazard –** An unavoidable danger or risk, even though often foreseeable.

**Heat –** The type of energy that causes the temperature of an object or environment to rise.

**Heifer –** The young female of the cattle species, usually applies to the female that has not yet had a calf.

**Hen –** A female fowl; specifically, the female domestic fowl valued for its egg production.

**Herbaceous –** Not woody, dying back to the ground each year.

**Herbivore –** A consumer that eats primary producers.

**Herbivorous –** Designating an animal (herbivore) that feeds, in the native state, on grass and other plants, as cattle, horses, sheep, goats, deer, elk, etc.

**Hindgut –** The posterior part of the alimentary canal between the midgut and anus.

**Hock –** The region of the tarsal joint in the hind leg of a horse or other quadruped, corresponding to the angle in people.

**Horizon –** A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes.

**Hormone –** A chemical substance formed in some organ of the body, secreted directly into the blood, and carried to another organ or tissue, where it produces a specific effect.

**Horseplay –** Rough or boisterous play or pranks.

**Hydroelectric –** Generating electricity by conversion of the energy of running water.

**Hydroelectric power –** Producing electricity from water-driven turbine generators.

**Hydrogen fuel cell –** Adevice that produces electricity by combining a fuel, usually hydrogen, with oxygen.

**Hydroxyl –** The chemical group or ion OH- that consists of one atom of hydrogen and one of oxygen.

**Hygiene –** The science of health; the rules or principles of maintaining health in people and animals; sanitation.

**Hypothesis –** A statement that can be tested experimentally.

**I**

**Imperfect flower –** Flower that lack either stamens or pistils.

**Import –** To bring in (merchandise, commodities, workers, etc.) from a foreign country for use, sale, processing, or services.

**Impression –** The first and immediate effect of an experience or perception upon the mind; sensation.

**Inch –** A unit of length, 1/12 foot, equivalent to 2.54 centimeters.

**Incomplete flower –** A flower that lacks one or more of the four organs: sepals, petals, stamens, or pistils.

**Increment –** An amount by which something increases or grows.

**Incubator –** An apparatus or chamber that provides favorable environmental conditions for the growth of cultures.

**Infer –** To derive by reasoning; conclude or judge from premises or evidence.

**Infiltration –** The seepage of water into soil or rock.

**Ingredient –** something that enters as an element into a mixture; a constituent element of anything; component.

**Inheritance –** The transmission of genetic factors from parent to offspring.

**Input –** Supplies and services farmers use to produce crops and livestock; any resource used in production.

**Inquiry –** A seeking or request for truth, information, or knowledge.

**Instinct –** The ability of an animal based upon its genetic makeup to respond to an environmental stimulus; it does not involve a mental decision.

**Insulation –** A material that prevents the passage of heat into or out of an object.

**Interdependence –** Mutually dependent; depending on each other.

**Internal drainage –** The relative degree of downward movement of water in a soil. Also called permeability.

**Irrigation –** The artificial application of water to soil for the purpose of increasing plant production.

**J**

**Job –** A piece of work, a specific task done as part of the routine of one's occupation or for an agreed price.

**K**

**Kid –** A young goat.

**Kinetic Energy –** Energy used to perform work.

**Kitten –** A young cat.

**L**

**Lake –** Any standing body of inland water.

**Lamb –** 1) The meat derived from sheep less than one year of age. 2) The young of sheep; specifically, a young ovine that has not yet acquired the front pair of permanent incisor teeth.

**Landform –** One of the multitudinous features that taken together make up the surface of the earth. It includes all broad features, such as plain, plateau, and mountain, and also all the minor features, such as hill, valley, slope, canyon, and alluvial fan.

**Landscape** – To improve the appearance of an area of land by planting trees, shrubs, or grass, or altering the contours of the ground.

**Latitude –** The angular distance north or south from the equator of a point on the earth's surface, measured on the meridian of the point.

**Leaching –** The removal of soluble constituents from soils or other materials by percolating water.

**Leaf –** A flattened outgrowth from a plant stem, varying in size and shape, usually green, which is concerned primarily with the manufacture of carbohydrates by photosynthesis.

**Lean –** Designating an animal lacking in condition of flesh or finish.

**Legal description –** The exact, geographical survey description of real estate used in abstracts of title and on the legal estate tax roles.

**Light intensity –** The quantity of visible light that is emitted in unit time per unit solid angle.

**Linear –** In a straight line.

**Livestock –** Farm animals raised to produce milk, meat, work, and wool; includes beef and dairy cattle, swine, sheep, horses, and goats; may also include poultry.

**Loaf –** To loiter or lounge around in an idle way.

**Loam –** Soil that consists of less than 52 percent sand, 28 to 50 percent silt, and 7 to 27 percent clay, resulting in a soil texture ideal for gardening.

**Longitude –** Angular distance east or west on the earth's surface, measured by the angle contained between the meridian of a particular place and some prime meridian, as that of Greenwich, England, and expressed either in degrees or by some corresponding difference in time.

**Lysine –** A crystalline, basic, amino acid, produced chiefly from many proteins by hydrolysis, essential in the nutrition of humans and animals.

**Lysosome –** An organelle containing digestive enzymes, existing primarily in animal cells.

**M**

**Macronutrient –** Chemical element necessary in relatively large amounts.

**Major –** Specialization in a particular subject at a college or university.

**Majority –** One half of the members present plus one.

**Management –** The technique, practice, or science of managing, controlling, or dealing with.

**Mare –** A mature female horse.

**Mass –** The quantity of matter as determined from its weight.

**Maturation –** Becoming mature or ripe.

**Meat –** The edible flesh of an animal.

**Medium –** A soil or material, such as sand, peat moss, vermiculite, etc., in which plants are raised or cuttings are rooted, especially in the greenhouse.

**Melting –** In relation to water, changing from a solid to a liquid.

**Meridian –** A true north and south line; a line from which range lines are established in the General Land Office Survey.

**Message –** The point, moral, or meaning of a gesture, image, or utterance.

**Metabolism –** The sum of all chemical processes in living things.

**Meter (m) –** A metric unit of linear measure equaling 39.37 inches.

**Metes and Bounds –** A means of defining legal boundaries of land by giving the bearings and distances from points of reference. Often a tree, stone, or some natural feature is used in the description.

**Methane –** A gas released from the decomposition of wastes.

**Metric system –** A decimal system of measures and weights.

**Micronutrient –** Chemical element necessary in relatively small amounts.

**Microorganism –** An organism so small that it cannot be seen clearly without the use of a microscope; a microscopic or submicroscopic organism.

**Millimeter (mm) –** One thousandth of a meter.

**Mineral –** 1) A chemical compound or element of inorganic origin. 2) Designating the inorganic nature of a substance.

**Mineral soil –** Soil whose properties are dominated by soil minerals, usually containing less than 20 percent organic matter.

**Mitochondria –** Organelles that are the site of aerobic respiration in eukaryotic cells.

**Molecule –** The smallest part of a substance that can exist separately and still retain its chemical properties and characteristic composition; the smallest combination of atoms that will form a given chemical compound.

**Monocular –** Of, relating to, or for the use of only one eye.

**Motion –** Formally introduced statement or idea for a group to consider.

**Mottle –** Color difference on a mass of moderately poorly drained soil.

**Muscularity –** The degree of muscle.

**Musculoskeletal system –** Concerning, involving, or made up of both the muscles and the bones.

**N**

**Natural gas –** A combustible mixture of gaseous hydrocarbons that accumulates in porous sedimentary rocks, esp. those yielding petroleum, consisting usually of over 80 percent methane together with minor amounts of ethane, propane, butane, nitrogen, and, sometimes, helium.

**Natural monuments –** Trees, stones, rivers, or lakes used as a point or a starting point when using the metes and bounds means of defining land boundaries.

**Natural resources –** The natural wealth of a country, consisting of land, forests, mineral deposits, water, etc.

**Nervous system –** The system of nerves and nerve centers in an animal or human, including the brain, spinal cord, nerves, and ganglia.

**Neutral –** Exhibiting neither acid nor alkaline qualities.

**Non-point source pollution –** Pollution that is diffuse in both origin and in time and points of discharge, and depend heavily on weather conditions such as rainstorms and snowmelt. Pollutants can originate from natural source areas as well as areas affected by people’s activities.

**Non-verbal communication –** Messages conveyed by a person’s behavior and the physical environment.

**Norms –** Group standards expected of all members.

**Nuclear power –** Using energy from a fission process for an energy source.

**Nuclei –** Plural for nucleus.

**Nucleolus –** A small, rounded body within the cell nucleus, functioning in ribosome manufacture.

**Nucleotide –** Each strand of DNA is a linear arrangement of repeating similar units called nucleotides, which are each composed of one sugar, one phosphate, and a nitrogen base.

**Nucleus –** The central portion of the cell protoplast surrounded by a very thin membrane. It consists of nucleoplasm and includes within itself variously arranged chromatin, nuclear sap, and nutritive substances. It is of crucial significance in metabolism, growth, reproduction and the transmission of the determiners of hereditary characters.

**Nursery –** Any place where plants, shrubs, and trees are grown for transplanting.

**Nutrient –** 1) A substance that favorably affects the nutritive processes of the body; a food. In stock feeding, any feed constituent or group of feed constituents of the same general composition that aids in the support of life, as water, proteins, carbohydrates, fats, minerals, and vitamins. 2) An element or compound in a soil that is essential for the growth of a plant. 3) Substance necessary for the functioning of an organism.

**Nutrition –** The sum of the processes by which an organism utilizes the chemical components of food through metabolism to maintain the structural and biochemical integrity of its cells, thereby ensuring its viability and reproductive potential.

**O**

**Observation –** An act or instance of noticing or perceiving.

**Omnivore –** An animal that eats both plants and animals.

**Optimum –** the best or most favorable point, degree, amount, etc., as of temperature, light, and moisture for the growth or reproduction of an organism

**Organ –** A distinct part of a plant or animal that carries on one or more particular functions; e.g., a leaf, wing of a bird.

**Organelle –** The inside parts of a cell such as the Golgi apparatus, nucleus, ribosomes, microtubules, and storage particles.

**Organic matter –** Matter found in, or produced by, living animals and plants, which contains carbon, hydrogen, oxygen, and often nitrogen and sulfur.

**Organism –** Any living individual whether plant or animal.

**Orthographic drawing –** A type of drawing where all surfaces are projected onto flat planes that generally are 90° angles to one another.

**Outbreak –** A sudden breaking out or occurrence; eruption; a sudden and active manifestation.

**Ovary –** The portion of the pistil or carpel of a flower that contains one or more ovules.

**Ovine –** An animal of the subfamily *Ovidae*; sheep.

**Ovule –** The body that, after fertilization, becomes the seed; the egg-containing unit of the ovary.

**P**

**Pack –** A group of certain animals of the same kind, especially predatory ones.

**Parent material –** The horizon of weathered rock or partially weathered soil material from which the soil is formed.

**Parliamentary procedures –** A set of rules and procedures to follow to keep a meeting orderly and harmonious, and guarantee that all persons have equal opportunity to express themselves.

**Particulates –** Finely divided solid or liquid particles in the air or in an emission. Include dust, smoke, fumes, mist, spray, and fog.

**Pathogenic –** Capable of producing disease.

**Peak –** The pointed top of a mountain or ridge.

**Ped –** A unit of soil structure such as an aggregate, crumb, prism, block, or granule, formed by natural processes (in contrast with a clod, which is formed artificially by compression of a wet clay soil).

**Perception –** A single unified awareness derived from sensory processes while a stimulus is present.

**Percolation –** The downward movement of water through the soil in response to the pull of gravity.

**Perfect flower –** A flower with both stamens and a pistil or pistils.

**Permanent wilting point –** Point at which no more water is available to the plant.

**Permeability –** The capacity of soil or rock for transmitting a fluid. Degree of permeability depends upon the size and shape of the pores, the size, and shape of their interconnections, and the extent of the latter.

**Peroxisome –** A cell organelle containing enzymes that catalyze the production and breakdown of hydrogen peroxide.

**Perspire –** To secrete a salty, watery fluid from the sweat glands of the skin, especially when very warm as a result of strenuous exertion; sweat.

**Petal –** A division of a flower inside the calyx; a unit of the corolla, consisting of petioles, which usually surrounds the pistils and stamens.

**Petri dish –** A shallow, circular, glass or plastic dish with a loose-fitting cover over the top and sides, used for culturing bacteria and other microorganisms.

**Petroleum –** An oily, thick, flammable, usually dark-colored liquid that is a form of bitumen or a mixture of various hydrocarbons, occurring naturally in various parts of the world and commonly obtained by drilling: used in a natural or refined state as fuel, or separated by distillation into gasoline, naphtha, benzene, kerosene, paraffin, et cetera.

**pH –** A numerical measure of acidity or hydrogen ion activity of a substance.

**pH scale –** A numeric range that quantifies the relative concentrations of hydronium ions and hydroxide ions in a solution.

**Photosynthesis –** Process by which green plants, using chlorophyll and the energy of sunlight, produce carbohydrates from water and carbon dioxide, and release oxygen.

**Photovoltaic cell –** Converts light energy into electrical energy. Also referred to as solar cell.

**Physiology –** The science that deals with the function of a plant or animal’s body and its organs, systems, tissues, and cells.

**Pictorial drawing –** A drawing that shows three views in one.

**Pistil –** The female element of a flower; composed of stigma, style, and ovary.

**Pistillate –** Designating a flower that has a pistil or pistils but lacks stamens; an imperfect flower.

**Pitch –** The degree of height or depth of a tone or of sound, depending upon the relative rapidity of the vibrations by which it is produced.

**Placement SAE –** Career experience where a student is placed with an employer who is conducting agricultural business such as farming, ranching, greenhouse operations, and others.

**Point source pollution –** Pollution that occurs from a single source.

**Poise –** Composure under pressure situations.

**Pollen –** The male element that carries the spores in the fertilization of the egg nucleus in the ovule of a flower. The pollen is borne by the anthers and is usually a yellowish, dust-like mass of separate grains.

**Pollen tube –** Tube formed following the germination of a pollen grain, when the grain resides on the stigma of a flower. The tube carries the male gametes to the ovule.

**Pollination –** The transfer of the pollen from the anther to the stigma of a flower, the first step in producing a fruit or seed.

**Pollution –** The presence of substances in a body of water, soil, or air to impair the usefulness or render it offensive to the senses of sight, taste, or smell.

**Porcine –** Refers to swine.

**Pork –** The meat of swine.

**Porosity –** Refers to the extent of voids or openings in the soil that exist between soil particles and soil peds or clods. These pores hold water and air for absorption by plant roots. About half of soil volume which is in a good physical condition for plant growth is pore space.

**Portfolio –** A collection of items used to organize documentation of your abilities and competencies.

**Potential Energy –** Energy that has the ability to perform work, but is not being used.

**Poultry –** Any or all domesticated fowls that are raised primarily for their meat, eggs, or feathers, as chickens, turkeys, ducks, and geese.

**PPE –** Personal Protective Equipment. Items used to protect the safety of an individual.

**Practice –** A usual or customary action or proceeding.

**Precipitant –** A substance that causes a precipitate to form when added to a solution.

**Precipitation –** The amount of water, hail, sleet, snow, or other moisture received from clouds.

**Prediction –** To develop an assumption of an anticipated outcome.

**Presence –** The ability to project a sense of ease, poise, or self-assurance, especially the quality or manner of a person's bearing before an audience.

**Procedure –** One of a series of steps taken to accomplish an end.

**Processing –** Turning raw agricultural products into consumable food.

**Producer –** 1) A person who grows a crop. 2) An organism, as a plant, that is able to produce its own food from inorganic substances.

**Professional –** The standards of a profession; having or showing great skill; expert.

**Prokaryote –** A unicellular organism that lacks a nucleus and membrane-bound organelles.

**Pronunciation –** The form and accent a speaker gives to the syllables of a word.

**Protein –** Any of a large number of complex, organic compounds of amino acids which has a high molecular weight and is an essential part of all living organisms. They are obtained from foods such as lean meats, and from vegetables such as beans.

**Protein synthesis –** The formation of proteins using information coded on DNA and carried by RNA.

**Pullet –** An immature female chicken.

**Pup –** A young dog; puppy.

**Q**

**Qualitative –** Observable information based on physical characteristics.

**Quality –** A combination of the skin, hair, coat, head, throatlatch, feet, and bone structure.

**Quantitative –** Measurable information.

**Queen –** Female cat.

**R**

**Ram –** A male sheep, which has not been castrated, usually used for breeding.

**Ratio –** The proportion of one component to another.

**Ration –** The feed allowed an animal during a 24-hour period regardless of whether it is fed at one time or at different times.

**Reaction –** Action in response to some influence.

**Rectangular system of land division –** A system of land division that is based upon permanent meridian and latitude lines yielding rectangular shaped land areas.

**Reduction –** Process of removing soil from the surface.

**Refrigeration –** Artificial cooling, either by the application of ice or by utilizing the principle of the latent heat of evaporation.

**Renal –** Pertaining to the kidneys or the surrounding regions.

**Renewable energy –** Renewable resources; resources that can be replaced after use through natural means.

**Reproduction –** The making of a new plant or animal.

**Reproductive system –** The organs of the body, either male or female, concerned with producing offspring.

**Research –** Diligent and systematic inquiry or investigation into a subject in order to discover or revise facts, theories, and applications.

**Research SAE –** An activity where students plan and conduct major agricultural experiments using the scientific process and discover new knowledge.

**Respiration –** 1) A chemical process that takes place in living cells whereby food (fats, carbohydrates, and proteins) is “burned” (oxidized) to release energy and waste products, mainly carbon dioxide and water. Living things use energy produced through respiration to derive vital life processes, such as growth and reproduction. 2) In animals, the act of breathing; the drawing of air into the lungs and its exhalation.

**Retailer –** A person or store who sells directly to the consumer.

**Ribonucleic acid (RNA) –** The substance in the living cells of all organisms that carries genetic information needed to form protein in the cell.

**Ribosome –** An organelle that functions in the synthesis of proteins.

**Ridge –** Any broad or narrow, crested, elongated land feature that rises above or separates lowlands, plains, or valley basins.

**River –** A stream of water bearing the waste of the land from higher to lower ground.

**Rock –** Mineral matter of variable composition, consolidated or unconsolidated, assembled in masses or considerable quantities in nature.

**Rooster –** Male chicken.

**Root –** The lower portion of a plant bearing neither leaves nor reproductive organs that mostly develops underground and anchors the plant in the soil. It bears the root hairs, which absorb water and mineral nutrients.

**Rough endoplasmic reticulum –** The portion of the endoplasmic reticulum that contains attached ribosomes.

**Rumen –** The largest compartment of the stomach of cattle, sheep, and goats and their relatives; a large amount of bacterial fermentation of feed materials occurs in the rumen.

**Runoff –** The total stream discharge of water, including both surface and subsurface flow.

**S**

**SAE –** Supervised Agricultural Experience.

**Safety –** The freedom from accidents.

**Safety color –** Color used as part of a standardized coding system according to which each color conveys a specific safety message.

**Sand –** A group of textural classes in which the particles are finer than gravel but coarser than silt, ranging in size from 2.00 to 0.050 mm in diameter.

**Sanitation –** The developing and practical application of measures designed to maintain or restore healthful conditions.

**Scale –** The size of a plan compared with that of the object it represents.

**School based SAE –** A student managed entrepreneurial or placement SAE that takes place in a school setting outside of regular class time.

**Scientific method –** A procedure for investigating problems of a scientific nature.

**Secretory vesicle –** Membrane bounded vesicle derived from the Golgi apparatus and containing material to be released from the cell.

**Section –** A unit of township that is 640 acres.

**Seed –** The embryo of a plant; also kernel of corn, wheat, etc., which botanically are seed-like fruits as they include the ovary wall.

**Selection –** Choosing certain individuals for breeding purposes in order to propagate or improve some desired quality or characteristic in the offspring.

**Sepal –** Small, green, leaf-life structure found at the base of a flower.

**Service learning SAE –** A student managed service activity where students are involved in the development, implementation, promotion and evaluation of a chosen project.

**Sexual reproduction –** Union of an egg and sperm to produce a seed or fertilized egg.

**Shelter –** Something beneath or within which a person, animal, or thing is protected from adverse conditions.

**Silt –** Small, mineral, soil particle, ranging in diameter from 0.050 to 0.002 mm.

**Sketch –** A rough drawing of an idea, object, or procedure.

**Slurry –** A thin mixture of water and any fine insoluble materials such as clay.

**Smooth endoplasmic reticulum –** The portion of the endoplasmic reticulum that actively transports K+ ions into and Na+ ions out of cells.

**Soil –** The mineral and organic surface of the earth capable of supporting upland plants. It has been (and is being) formed by the active factors of climate and biosphere exerting their influence on passive parent material and topography over neutral time.

**Soil particle –** A soil separate in the mechanical analysis of soil.

**Soil profile –** A vertical section of a soil. The section, or face of an exposure made by a cut, may exhibit with depth a succession of separate layers although these may not be separated by sharp lines of demarcation.

**Soil structure –** The arrangement of primary soil particles into compound particles or aggregates that are separated from adjoining aggregates.

**Solar energy –** Using the sun as a heat energy source.

**Soot –** Very finely divided carbon particles clustered together in long chains.

**Sow –** A female swine, usually one that shows evidence of having produced pigs or one that is obviously pregnant.

**Speech –** The faculty or power of oral communication; the ability to express one's thoughts and emotions by speech sounds and gesture.

**Spoilage –** Any objectionable change which has occurred in a food, feed, or material.

**Stallion –** A male horse used for breeding purposes.

**Stamen –** The organ of a flower which bears the pollen (microspores) consisting of the stalk (filament) and the anther.

**Staminate –** Designating a flower that has stamens but no pistil and hence is imperfect.

**Steer –** A male bovine castrated before reaching puberty.

**Stem –** Stalk, trunk, branch of a plant. Can be vertical or horizontal.

**Stigma –** The receptive surface of the female organ of a flower that receives the pollen.

**Stimulus –** Something that incites to action or exertion or quickens action, feeling, thought, et cetera.

**Stream –** Flowing water from a natural or artificial channel.

**Structural soundness –** The physical condition of the skeletal structure, especially the feet and legs, of an animal.

**Style –** In the pistil of a flower, the part between the ovary and the stigma.

**Subsoil –** The first change with depth in texture or structure in a soil profile.

**Surface water –** Water on the surface, as lakes and rivers, in contrast to that underground.

**Switchgrass –** A warm season tall grass that is native to the tall-grass prairies of the arid regions of the U.S.

**Synthesis –** The forming or building of a more complex chemical substance or compound from elements or simpler compounds.

**T**

**Taiga –** Forested biome characterized by cone-bearing evergreen trees.

**Taxonomy –** The science of classification of organisms and other objects and their arrangement into systematic groups such as species, genus, family, and order.

**Team –** People working together toward a common goal.

**Temperate zone –** The part of the earth's surface lying between the tropic of Cancer and the Arctic Circle in the Northern Hemisphere or between the tropic of Capricorn and the Antarctic Circle in the Southern Hemisphere, and characterized by having a climate that is warm in the summer, cold in the winter, and moderate in the spring and fall.

**Temperature –** A measure of the warmth or coldness of an object or substance with reference to some standard value.

**Texture –** The relative portions of sand, silt, and clay particles in a mass of soil.

**Theory –** A proposed explanation whose status is still conjectural and subject to experimentation, in contrast to well-established propositions that are regarded as reporting matters of actual fact.

**Threshold –** The point that must be exceeded to begin producing a given effect or result or to elicit a response.

**Thymine –** One of the four bases of DNA; it pairs only with adenine.

**Title block –** The section of a drawing reserved for information about the drawing in general.

**Tom –** A male cat or turkey.

**Tone –** The particular or relative pitch of a word, phrase, or sentence.

**Tool –** An implement, especially one held in hand, as a hammer, saw, or file, for performing or facilitating mechanical operations.

**Top soil –** Surface or subsurface soils which presumably are fertile soils, rich in organic matter r humus debris.

**Topography –** Slope of the land and the position on the landscape, such as the top of a hill, a hillside, or the foot of a slope.

**Total dissolved solids –** Abbreviated TDS. It is a measure of the combined content of all inorganic and organic substances contained in a liquid in molecular or ionized suspended form.

**Township –** An area of land that is 6 miles by 6 miles.

**Tract –** An area of land of any size.

**Traits –** An inherited feature or characteristic.

**Transformation –** Change in form, appearance, nature, or character.

**Translocation –** To move or transfer from one place to another; cause to change location; displace.

**Transpiration –** The passage of water through a plant from the roots through the vascular system to the atmosphere.

**Transportation –** The act or state of being transported; the business of conveying goods.

**Triangulation –** A geometric technique used to determine a location.

**Trophic level –** A feeding level in an ecosystem.

**Tropical zone –** The region of the earth bisected by the equator and extending at low elevations to the Tropic of Cancer and south to the Tropic of Capricorn, characterized by moderate to warm temperatures year-round.

**Tundra –** A biome of low-growing vegetation.

**Turbidity –** Cloudiness of water caused by the presence of colloidal matter or other finely divided suspended matter.

**Turbine –** A high-speed rotary engine driven by water, wind, steam, or other gases.

**Turgor –** The distension of the cell wall and protoplasmic layer of plants by fluids.

**Turgor pressure –** Water pressure within a plant cell.

**U**

**Uniform –** An identifying outfit or style of dress worn by the members of a given profession, organization, or rank.

**V**

**Vacuole –** A fluid-filled organelle that stores enzymes or metabolic wastes in a plant cell.

**Valley –** An elongated, erosional depression usually occupied by a stream that has a downward slope conforming to the direction of flow of the occupying stream, and includes both bottomland and slopes.

**Variable –** In an experiment, the factor being tested.

**Vegan –** A vegetarian who omits all animal products from the diet.

**Vegetable –** Any herbaceous plant whose fruit, seeds, roots, tubers, bulbs, stems, leaves, or flower parts are used as food.

**Vegetarian –** One who, because of cultural reasons or personal conviction, abstains from eating meat.

**Verbal Communication –** Expressed in spoken words.

**Vision –** The act of anticipating that which will or may come to be.

**Vitamin –** An organic substance that performs specific and necessary functions in relatively small concentrations in an organism. Required for normal growth and maintenance, vitamins are not utilized as building units for the structure of the organism and do not furnish energy, but are essential for the transformation of energy and for the regulation of the metabolism of the organisms.

**Voice –** Expression in spoken or written words.

**Volt (V) –** The unit of measurement for voltage.

**Voltage –** A measure of electrical pressure.

**Volume –** The amount of space, measured in cubic units, that an object or substance occupies.

**W**

**Warning –** Something that serves to warn, give notice, or caution.

**Water –** Hydrogen oxide. The most valuable natural resource and the most limiting factor in crop production.

**Water holding capacity –** The ability of a soil to hold water in the root zone.

**Watt (W) –** The unit of measurement for wattage.

**Wattage –** A measure of energy available or work that can be done using one ampere at one volt.

**Waypoint –** Location of a single point on a GPS unit.

**Weathering –** Atmospheric action on rock surfaces producing decomposition, disintegration, or alteration of rocks at or close to the earth’s surface.

**Wether –** A male sheep or goat castrated before it reaches maturity or develops male characteristics.

**Wholesaler –** A person or business who sells to a retailer.

**Wilt –** Loss of freshness and a drooping of the foliage of a plant due to an inadequate supply of water, excessive transpiration by the plant, and as a result of a disease interfering with the utilization of water by the plant.

**Wind energy –** Power derived from wind: used to generate electricity or mechanical power.

**Work –** A change in position caused by a force.

**X**

**Y**

**Yard –** A unit of linear measurement equal to three feet or 36 inches.

**Z**

**Zoning –** Township, city, county, or state laws regulating land uses and development; used to implement and enforce plans to protect public health and welfare and attain the best use of the available land.

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