

## 10. Signs and Symbols

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- 10.1.** The increased use of signs and symbols and their importance in technical and scientific work have emphasized the necessity of standardization on a national basis and of the consistent use of the standard forms.
- 10.2.** Certain symbols are standardized—number symbols (the digits, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9); letter symbols (the letters of the alphabet, a, b, c, d, etc.); and graphic symbols (the mathematical signs +, −, ±, ×, ÷).
- 10.3.** The signs +, −, ±, ×, and ÷, etc., are closed against accompanying figures and symbols. When the × is used to indicate “crossed with” (in plant or animal breeding) or magnification, it will be separated from the accompanying words by a space.

i–vii+1–288 pages  
The equation  $A+B$   
The result is  $4\times 4$   
 $20,000\pm 5,000$

Early June  $\times$  Bright (crossed with)  
 $\times 4$  (magnification)  
miles  $\div$  gallons

### Symbols with figures

- 10.4.** In technical publications the degree mark is used in lieu of the word *degree* following a figure denoting measurement.
- 10.5.** Following a figure, the spelled form is preferred. The percent symbol is used in areas where space will not allow the word *percent* to be used.

In that period the price rose 12, 15, and 19 percent.

*not* In that period the price rose 12 percent, 15 percent, and 19 percent.

- 10.6.** Any symbol set close up to figures, such as the degree mark, number mark, dollar mark, or cent mark, is used before or after each figure in a group or series.

\$5 to \$8 price range  
5'–7' long, *not* 5–7' long  
3¢ to 5¢ (no spaces)  
 $\pm 2$  to  $\pm 7$ ;  $2^\circ \pm 1^\circ$   
#61 to #64

*but*  
§ 12 (thin space)  
¶ 1951 (thin space)  
from 15 to 25 percent  
45 to 65 °F *not* 45° to 65° F

## Letter symbols

- 10.7.** Letter symbols are set in italic (see rule 10.8) or in roman (see rule 9.56) without periods and are capitalized only if so shown in copy, since the capitalized form may have an entirely different meaning.

## Equations

- 10.8.** In mathematical equations, use italic for all letter symbols—capitals, lowercase, small capitals, and superiors and inferiors (exponents and subscripts); use roman for figures, including superiors and inferiors.
- 10.9.** If an equation or a mathematical expression needs to be divided, break before +, −, =, etc. However, the equal sign is to clear on the left of other beginning mathematical signs.
- 10.10.** A short equation in text should not be broken at the end of a line. Space out the line so that the equation will begin on the next line; or better, center the equation on a line by itself.
- 10.11.** An equation too long for one line is set flush left, the second half of the equation is set flush right, and the two parts are balanced as nearly as possible.
- 10.12.** Two or more equations in a series are aligned on the equal signs and centered on the longest equation in the group.
- 10.13.** Connecting words of explanation, such as *hence*, *therefore*, and *similarly*, are set flush left either on the same line with the equation or on a separate line.
- 10.14.** Parentheses, braces, brackets, integral signs, and summation signs should be of the same height as the mathematical expressions they include.
- 10.15.** Inferiors precede superiors if they appear together; but if either inferior or superior is too long, the two are aligned on the left.

## Chemical symbols

- 10.16.** The names and symbols listed below are approved by the International Union of Pure and Applied Chemistry. They are set in roman without periods.

| Element           | Symbol | Atomic No. | Element            | Symbol | Atomic No. |
|-------------------|--------|------------|--------------------|--------|------------|
| Actinium.....     | Ac     | 89         | Mendelevium.....   | Md     | 101        |
| Aluminum.....     | Al     | 13         | Mercury.....       | Hg     | 80         |
| Americium.....    | Am     | 95         | Molybdenum.....    | Mo     | 42         |
| Antimony.....     | Sb     | 51         | Moscovium.....     | Mc     | 115        |
| Argon.....        | Ar     | 18         | Neodymium.....     | Nd     | 60         |
| Arsenic.....      | As     | 33         | Neon.....          | Ne     | 10         |
| Astatine.....     | At     | 85         | Neptunium.....     | Np     | 93         |
| Barium.....       | Ba     | 56         | Nickel.....        | Ni     | 28         |
| Berkelium.....    | Bk     | 97         | Nihonium.....      | Nh     | 113        |
| Beryllium.....    | Be     | 4          | Niobium.....       | Nb     | 41         |
| Bismuth.....      | Bi     | 83         | Nitrogen.....      | N      | 7          |
| Bohrium.....      | Bh     | 107        | Nobelium.....      | No     | 102        |
| Boron.....        | B      | 5          | Oganesson.....     | Og     | 118        |
| Bromine.....      | Br     | 35         | Osmium.....        | Os     | 76         |
| Cadmium.....      | Cd     | 48         | Oxygen.....        | O      | 8          |
| Calcium.....      | Ca     | 20         | Palladium.....     | Pd     | 46         |
| Californium.....  | Cf     | 98         | Phosphorus.....    | P      | 15         |
| Carbon.....       | C      | 6          | Platinum.....      | Pt     | 78         |
| Cerium.....       | Ce     | 58         | Plutonium.....     | Pu     | 94         |
| Cesium.....       | Cs     | 55         | Polonium.....      | Po     | 84         |
| Chlorine.....     | Cl     | 17         | Potassium.....     | K      | 19         |
| Chromium.....     | Cr     | 24         | Praseodymium.....  | Pr     | 59         |
| Cobalt.....       | Co     | 27         | Promethium.....    | Pm     | 61         |
| Copernicium.....  | Cn     | 112        | Protactinium.....  | Pa     | 91         |
| Copper.....       | Cu     | 29         | Radium.....        | Ra     | 88         |
| Curium.....       | Cm     | 96         | Radon.....         | Rn     | 86         |
| Darmstadtium..... | Ds     | 110        | Rhenium.....       | Re     | 75         |
| Dubnium.....      | Db     | 105        | Rhodium.....       | Rh     | 45         |
| Dysprosium.....   | Dy     | 66         | Roentgenium.....   | Rg     | 111        |
| Einsteinium.....  | Es     | 99         | Rubidium.....      | Rb     | 37         |
| Erbium.....       | Er     | 68         | Ruthenium.....     | Ru     | 44         |
| Europium.....     | Eu     | 63         | Rutherfordium..... | Rf     | 104        |
| Fermium.....      | Fm     | 100        | Samarium.....      | Sm     | 62         |
| Flerovium.....    | Fl     | 114        | Scandium.....      | Sc     | 21         |
| Fluorine.....     | F      | 9          | Seaborgium.....    | Sg     | 106        |
| Francium.....     | Fr     | 87         | Selenium.....      | Se     | 34         |
| Gadolinium.....   | Gd     | 64         | Silicon.....       | Si     | 14         |
| Gallium.....      | Ga     | 31         | Silver.....        | Ag     | 47         |
| Germanium.....    | Ge     | 32         | Sodium.....        | Na     | 11         |
| Gold.....         | Au     | 79         | Strontium.....     | Sr     | 38         |
| Hafnium.....      | Hf     | 72         | Sulfur.....        | S      | 16         |
| Hassium.....      | Hs     | 108        | Tantalum.....      | Ta     | 73         |
| Helium.....       | He     | 2          | Technetium.....    | Tc     | 43         |
| Holmium.....      | Ho     | 67         | Tellurium.....     | Te     | 52         |
| Hydrogen.....     | H      | 1          | Tennessee.....     | Ts     | 117        |
| Indium.....       | In     | 49         | Terbium.....       | Tb     | 65         |
| Iodine.....       | I      | 53         | Thallium.....      | Tl     | 81         |
| Iridium.....      | Ir     | 77         | Thorium.....       | Th     | 90         |
| Iron.....         | Fe     | 26         | Thulium.....       | Tm     | 69         |
| Krypton.....      | Kr     | 36         | Tin.....           | Sn     | 50         |
| Lanthanum.....    | La     | 57         | Titanium.....      | Ti     | 22         |
| Lawrencium.....   | Lr     | 103        | Tungsten.....      | W      | 74         |
| Lead.....         | Pb     | 82         | Uranium.....       | U      | 92         |
| Lithium.....      | Li     | 3          | Vanadium.....      | V      | 23         |
| Livermorium.....  | Lv     | 116        | Xenon.....         | Xe     | 54         |
| Lutetium.....     | Lu     | 71         | Ytterbium.....     | Yb     | 70         |
| Magnesium.....    | Mg     | 12         | Yttrium.....       | Y      | 39         |
| Manganese.....    | Mn     | 25         | Zinc.....          | Zn     | 30         |
| Meitnerium.....   | Mt     | 109        | Zirconium.....     | Zr     | 40         |

## Standardized symbols

**10.17.** Symbols duly standardized by any national scientific, professional, or technical group are accepted as preferred forms within the field of the group. The issuing office desiring or requiring the use of such standardized symbols should see that copy is prepared accordingly.

## Signs and symbols

**10.18.** The following list contains some signs and symbols frequently used in printing. The forms and style of many symbols vary with the method of reproduction employed. It is important that editors and writers clearly identify signs and symbols when they appear within a manuscript.

### ACCENTS

- ˆ acute
- ˘ breve
- ˜ cedilla
- ⤿ circumflex
- ¨ dieresis
- ˋ grave
- ˉ macron
- ˘ tilde

- ⊙ dot in triangle in circle
- ⊕ cross in circle
- © copyright
- ♁ Ceres
- ♃ Pallas
- ♄ Juno
- ♁ Vesta

- ⦿ (184 N)
- ⦿ key
- ¶ (206 N)
- ¶ paragraph

### ARROWS

- direction
- ↖ direction
- ↗ direction
- ↘ direction
- ↙ direction
- ↔ bold arrow
- ↷ open arrow
- ⇌ reversible reaction

### BULLETS

- solid circle; bullet
- bold center dot
- movable accent

### CHEMICAL

- ‰ salinity
- ℓ minim
- ↕ exchange
- ↑ gas

### CIRCLED SYMBOLS

- ⊙ angle in circle
- ⊕ circle with parallel rule
- ⊖ triangle in circle
- ⊙ dot in circle

### CODE

- No. 1 6 pt. code dot
- No. 2 8 pt. code dot
- No. 3 10 pt. code dot
- No. 4 8 pt. code dot
- No. 4 10 pt. code dot
- No. 1 6 pt. code dash
- No. 2 8 pt. code dash
- No. 3 10 pt. code dash
- No. 4 8 pt. code dash
- No. 4 10 pt. code dash

### COMPASS

- ° degree
- degree with period
- ′ minute
- ′ minute with period
- ″ second
- ″ second with period
- canceled second

### DECORATIVE

- ⊕ bold cross
- ⊕ cross patte
- ⊕ cross patte
- ⊕ cross patte

### ELECTRICAL

- ℜ reluctance
- ↔ reaction goes both right and left
- ↑ reaction goes both up and down
- ↓ reversible
- direction of flow; yields
- direct current
- ⇌ electrical current
- ⇌ reversible reaction
- ⇌ reversible reaction
- ⇌ alternating current
- ⇌ alternating current
- ⇌ reversible reaction beginning at left
- ⇌ reversible reaction beginning at right
- Ω ohm; omega
- MΩ megohm; omega
- μΩ microohm; mu omega
- ω angular frequency, solid angle; omega
- Φ magnetic flux; phi
- Ψ dielectric flux; electrostatic flux; psi
- γ conductivity; gamma

| ELECTRICAL—Con.                                      | MATHEMATICAL—Con.   | MATHEMATICAL—Con.   |
|--|---|---|
| $\rho$ resistivity; rho                              | $\approx$ approaches a limit  | $\parallel$ double bond                                       |
| $\Lambda$ equivalent conductivity                    | $\sphericalangle$ equal angles                                      | $\parallel\parallel$ double bond                              |
| HP horsepower  | $\neq$ not equal to   | $\parallel\parallel$ double bond                              |
|  | $\equiv$ identical with   | $\bigcirc$ benzene ring                                       |
|  | $\not\equiv$ not identical with                                     | $\partial$ or $\delta$ differential; variation                |
|  | $\frac{\text{N}}{\text{N}}$ score                                   | $\partial$ Italian differential                               |
| <b>MATHEMATICAL</b>                                  | $\approx$ or $\doteq$ nearly equal to                               | $\rightarrow$ approaches limit of                             |
| — vinculum (above letters)                           | $=$ equal to  | $\sim$ cycle sine   |
| $\therefore$ geometrical proportion                  | $\sim$ difference   | $\int$ horizontal integral                                    |
| $\therefore$ difference, excess                      | $\cong$ perspective to  | $\oint$ contour integral                                      |
| $\parallel$ parallel                                 | $\cong$ congruent to approximately equal                            | $\propto$ variation; varies as                                |
| $\parallel\parallel$ parallels                       | $\doteq$ difference between   | $\Pi$ product   |
| $\neq$ not parallels                                 | $\diamond$ geometrically equivalent to                              | $\Sigma$ summation of; sum; sigma                             |
| $   $ absolute value                                 | $($ included in   | $!$ or $\perp$ factorial product                              |
| $\cdot$ multiplied by                                | $)$ excluded from   |   |
| $:$ is to; ratio                                     | $\subset$ is contained in   | <b>MEASURE</b>  |
| $+$ divided by                                       | $\cup$ logical sum or union   | $\text{lb}$ pound   |
| $\therefore$ therefore; hence                        | $\cap$ logical product or intersection                              | $\text{gr}$ dram  |
| $\because$ because                                   | $\sqrt{\quad}$ radical  | $\text{fl oz}$ fluid dram                                     |
| $\therefore$ proportion; as                          | $\sqrt{\quad}$ root   | $\text{oz}$ ounce   |
| $\ll$ is dominated by                                | $\sqrt{\quad}$ square root  | $\text{fl oz}$ fluid ounce                                    |
| $\gt$ greater than                                   | $\sqrt{\quad}$ cube root  | $\text{pt}$ pint  |
| $\supset$ greater than                               | $\sqrt{\quad}$ fourth root  |   |
| $\supseteq$ greater than or equal to                 | $\sqrt{\quad}$ fifth root   | <b>MISCELLANEOUS</b>  |
| $\supseteq$ greater than or equal to                 | $\sqrt{\quad}$ sixth root   | $\S$ section  |
| $\supseteq$ greater than or less than                | $\pi$ pi  | $\dagger$ dagger  |
| $\supsetneq$ is not greater than                     | $e$ base (2.718) of natural system of logarithms; epsilon           | $\ddagger$ double dagger                                      |
| $\lt$ less than                                      | $\epsilon$ is a member of; dielectric constant; mean error; epsilon | $\%$ account of   |
| $\lneq$ less than                                    |   | $\%$ care of  |
| $\lneq$ less than or greater than                    |   | $\frac{\text{N}}{\text{N}}$ score                             |
| $\nlessgtr$ is not less than                         | $+$ plus  | $\text{¶}$ paragraph  |
| $\lessgtr$ smaller than                              | $+$ bold plus   | $\text{þ}$ Anglo-Saxon  |
| $\lessgtr$ less than or equal to                     | $-$ minus   | $\text{¢}$ center line  |
| $\lessgtr$ less than or equal to                     | $-$ bold minus  | $\sigma$ conjunction  |
| $\lessgtr$ or $\geq$ greater than or equal to        | $/$ shill(ing); slash; virgule                                      | $\perp$ perpendicular to                                      |
| $\lessgtr$ equal to or less than                     | $\pm$ plus or minus   | " or " ditto  |
| $\lessgtr$ equal to or less than                     | $\mp$ minus or plus   | $\propto$ variation   |
| $\lessgtr$ is not greater than equal to or less than | $\times$ multiplied by  | $\text{R}$ recipe   |
| $\lessgtr$ equal to or greater than                  | $\equiv$ bold equal   | $\rightarrow$ move right                                      |
| $\lessgtr$ is not less than equal to or greater than | $\#$ number   | $\leftarrow$ move left  |
| $\perp$ equilateral                                  | $\text{p}$ per  | $\bigcirc$ or $\odot$ or $\text{\textcircled{1}}$ annual      |
| $\perp$ perpendicular to                             | $\%$ percent  | $\text{\textcircled{2}}$ or $\text{\textcircled{2}}$ biennial |
| $\text{T}$ assertion sign                            | $\int$ integral   | $\in$ element of  |
| $\approx$ approaches                                 | $ $ single bond   | $\text{\textcircled{D}}$ scruple                              |
|  | $\backslash$ single bond  | $f$ function  |
|  | $/$ single bond   | $!$ exclamation mark  |
|  |   | $\text{\textcircled{+}}$ plus in square                       |
|  |   | $\text{\textcircled{2}}$ perennial                            |

## MISCELLANEOUS—Con.

|   |                 |
|---|-----------------|
| ϕ | diameter        |
| ̄ | mean value of c |
| U | mathmodifier    |
| C | mathmodifier    |
| ◻ | dot in square   |
| △ | dot in triangle |
| ⊠ | station mark    |
| @ | at              |

## MONEY

|   |                |
|---|----------------|
| ¢ | cent           |
| ¥ | yen            |
| £ | pound sterling |
| ₥ | mills          |

## MUSIC

|   |         |
|---|---------|
| ♮ | natural |
| ♭ | flat    |
| ♯ | sharp   |

## PLANETS

|   |                                |
|---|--------------------------------|
| ♿ | Mercury                        |
| ♀ | Venus                          |
| ♁ | Earth                          |
| ♂ | Mars                           |
| ♃ | Jupiter                        |
| ♄ | Saturn                         |
| ♅ | Uranus                         |
| ♆ | Neptune                        |
| ♁ | dragon's head, ascending node  |
| ♆ | dragon's tail, descending node |
| ♌ | conjunction                    |
| ♍ | opposition                     |
| ☉ | or ☿ Sun                       |
| ☉ | Sun's lower limb               |
| ☉ | Sun's upper limb               |
| ☉ | solar corona                   |
| ☉ | solar halo                     |
| ☾ | Moon                           |
| ● | new Moon                       |
| ☾ | first quarter                  |
| ☾ | first quarter                  |
| ☾ | third quarter                  |
| ☾ | last quarter                   |
| ☾ | last quarter                   |
| ☾ | last quarter                   |
| ☾ | full Moon                      |
| ☾ | full Moon                      |
| ☾ | eclipse of Moon                |

## PLANETS—Con.

|   |              |
|---|--------------|
| ☾ | lunar halo   |
| ☾ | lunar corona |
| ♀ | Ceres        |
| ♃ | Juno         |

## PUNCTUATION

|     |                                       |
|-----|---------------------------------------|
| { } | braces                                |
| [ ] | brackets                              |
| ( ) | parentheses                           |
| ⟨ ⟩ | square parentheses;<br>angle brackets |
| !   | inverted exclamation mark             |
| ?   | inverted question mark                |

## SEX

|   |                   |
|---|-------------------|
| ♂ | or ♂ male         |
| ♂ | male, in charts   |
| ♀ | female            |
| ♀ | female, in charts |
| ♁ | hermaphrodite     |

## SHAPES

|   |                  |
|---|------------------|
| ◆ | solid diamond    |
| ◇ | open diamond     |
| ○ | circle           |
| ▲ | solid triangle   |
| △ | triangle         |
| □ | square           |
| ■ | solid square     |
| ▭ | parallelogram    |
| ▭ | rectangle        |
| ▭ | double rectangle |
| ★ | solid star       |
| ☆ | open star        |
| └ | right angle      |
| ∠ | angle            |
| ✓ | check            |
| ✓ | check            |
| ß | German ss        |
| ß | italic German ss |
| ■ | solid index      |
| ■ | solid index      |
| ☞ | index            |
| ☞ | index            |

GEOLOGIC SYSTEMS<sup>1</sup>

|   |            |
|---|------------|
| Q | Quaternary |
| T | Tertiary   |
| K | Cretaceous |

|    |               |
|----|---------------|
| J  | Jurassic      |
| ᠖  | Triassic      |
| P  | Permian       |
| P  | Pennsylvanian |
| M  | Mississippian |
| D  | Devonian      |
| S  | Silurian      |
| O  | Ordovician    |
| C  | Cambrian      |
| pC | Precambrian   |
| C  | Carboniferous |

## VERTICAL

|  |                  |
|--|------------------|
|  | 5 unit vertical  |
|  | 8 point vertical |
|  | 9 unit vertical  |

## WEATHER

|   |                                  |
|---|----------------------------------|
| T | thunder                          |
| ⚡ | thunderstorm;<br>sheet lightning |
| ☁ | sheet lightning                  |
| ↓ | precipitate                      |
| ☉ | rain                             |
| ← | floating ice crystals            |
| → | ice needles                      |
| ▲ | hail                             |
| ⊗ | sleet                            |
| ☁ | glazed frost                     |
| ⊖ | hoarfrost                        |
| ∇ | frostwork                        |
| * | snow or sextile                  |
| ⊗ | snow on ground                   |
| + | drifting snow (low)              |
| ≡ | fog                              |
| ∞ | haze                             |
| ☾ | Aurora                           |

## ZODIAC

|   |                        |
|---|------------------------|
| ♈ | Aries; Ram             |
| ♉ | Taurus; Bull           |
| ♊ | Gemini; Twins          |
| ♋ | Cancer; Crab           |
| ♌ | Leo; Lion              |
| ♍ | Virgo; Virgin          |
| ♎ | Libra; Balance         |
| ♏ | Scorpio; Scorpion      |
| ♐ | Sagittarius; Archer    |
| ♑ | Capricornus; Goat      |
| ♒ | Aquarius; Water bearer |
| ♓ | Pisces; Fishes         |

<sup>1</sup> Standard letter symbols used by the Geological Survey on geologic maps. Capital letter indicates the system and one or more lowercased letters designate the formation and member where used.