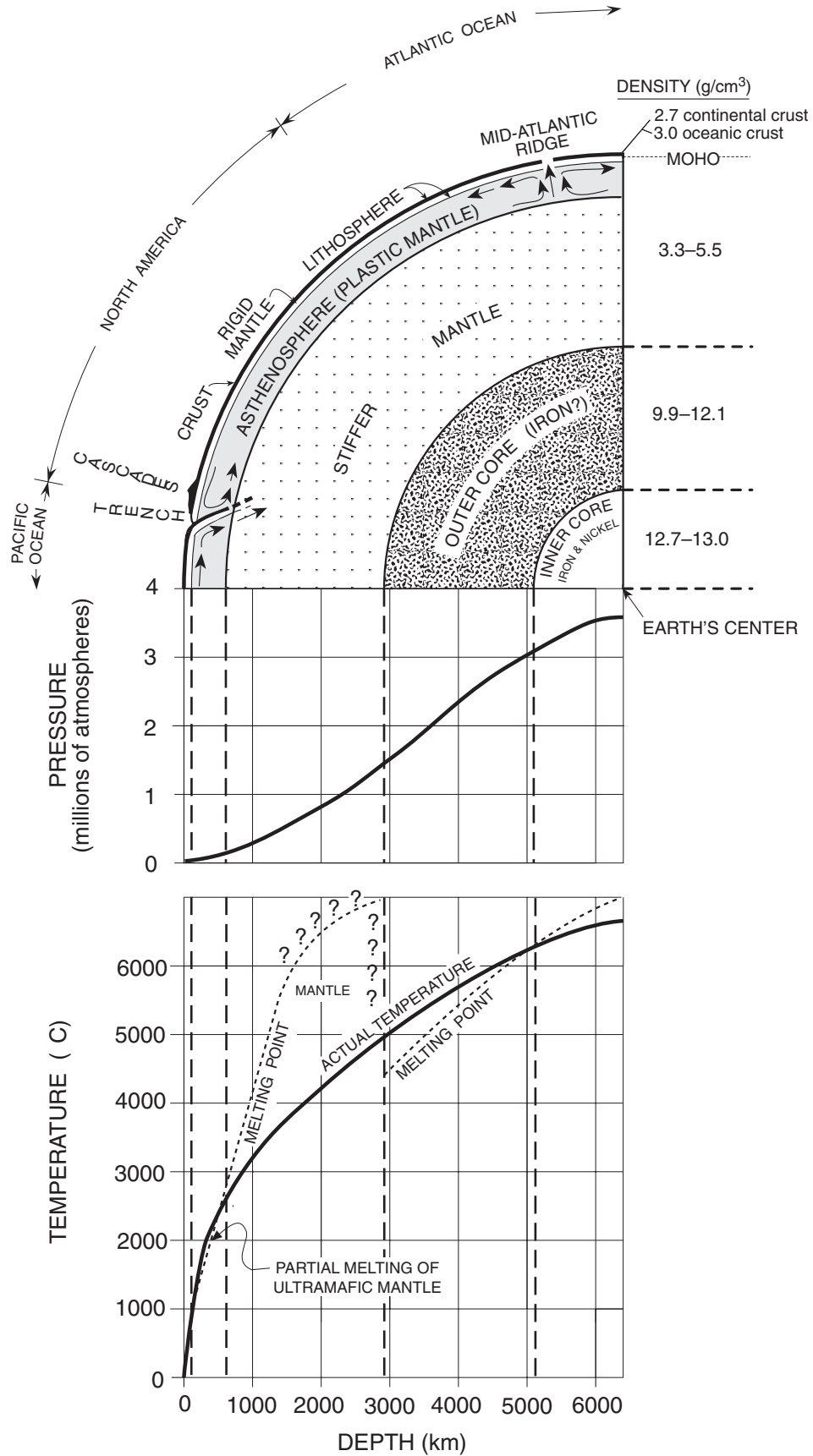


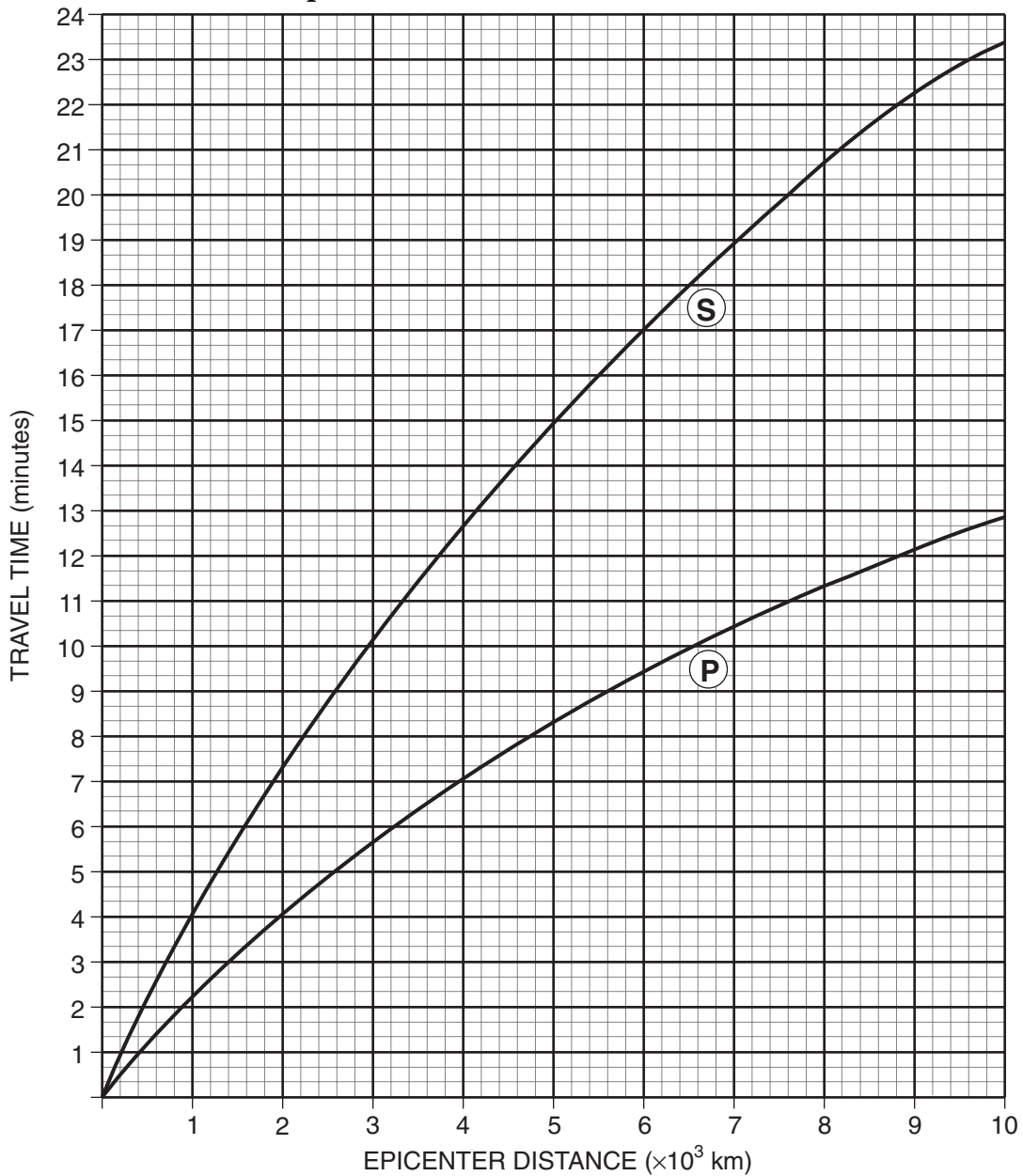
Inferred Properties of Earth's Interior



Average Chemical Composition of Earth's Crust, Hydrosphere, and Troposphere

| ELEMENT (symbol) | CRUST | | HYDROSPHERE | TROPOSPHERE |
|---------------------|--------------------|----------------------|----------------------|----------------------|
| | Percent by Mass | Percent by Volume | Percent by Volume | Percent by Volume |
| Oxygen (O) | 46.40 | 94.04 | 33.0 | 21.0 |
| Silicon (Si) | 28.15 | 0.88 | | |
| Aluminum (Al) | 8.23 | 0.48 | | |
| Iron (Fe) | 5.63 | 0.49 | | |
| Calcium (Ca) | 4.15 | 1.18 | | |
| Sodium (Na) | 2.36 | 1.11 | | |
| Magnesium (Mg) | 2.33 | 0.33 | | |
| Potassium (K) | 2.09 | 1.42 | | |
| Nitrogen (N) | | | | 78.0 |
| Hydrogen (H) | | | 66.0 | |
| Other | 0.66 | 0.07 | 1.0 | 1.0 |

Earthquake P-wave and S-wave Travel Time



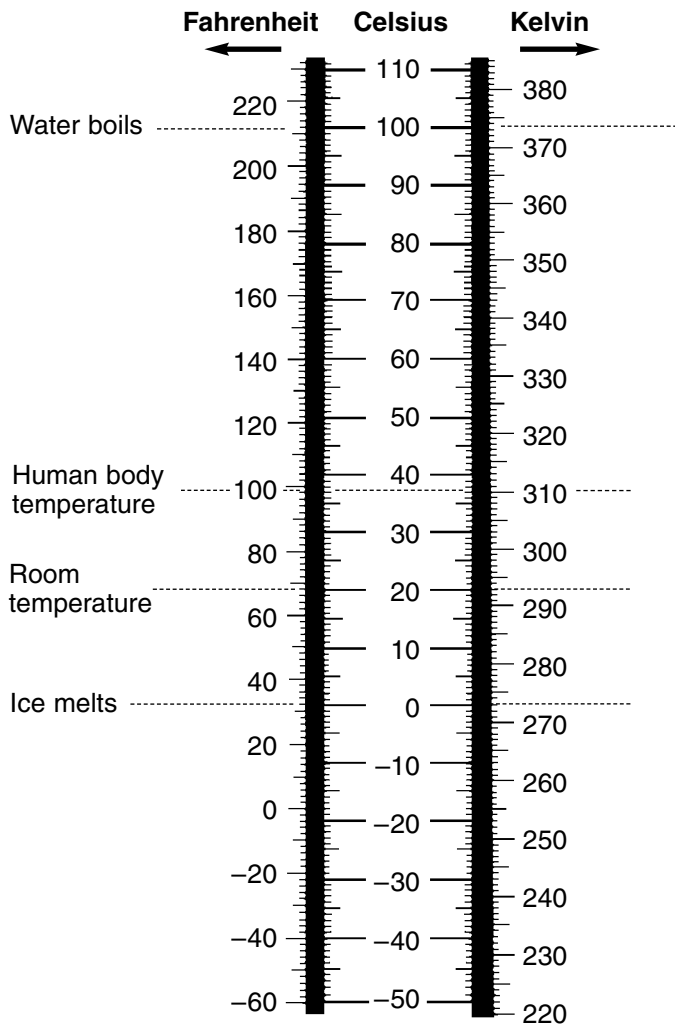
Dewpoint Temperatures (°C)

| Dry-Bulb Temperature (°C) | Difference Between Wet-Bulb and Dry-Bulb Temperatures (C°) | | | | | | | | | | | | | | | |
|---------------------------|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| -20 | -20 | -33 | | | | | | | | | | | | | | |
| -18 | -18 | -28 | | | | | | | | | | | | | | |
| -16 | -16 | -24 | | | | | | | | | | | | | | |
| -14 | -14 | -21 | -36 | | | | | | | | | | | | | |
| -12 | -12 | -18 | -28 | | | | | | | | | | | | | |
| -10 | -10 | -14 | -22 | | | | | | | | | | | | | |
| -8 | -8 | -12 | -18 | -29 | | | | | | | | | | | | |
| -6 | -6 | -10 | -14 | -22 | | | | | | | | | | | | |
| -4 | -4 | -7 | -12 | -17 | -29 | | | | | | | | | | | |
| -2 | -2 | -5 | -8 | -13 | -20 | | | | | | | | | | | |
| 0 | 0 | -3 | -6 | -9 | -15 | -24 | | | | | | | | | | |
| 2 | 2 | -1 | -3 | -6 | -11 | -17 | | | | | | | | | | |
| 4 | 4 | 1 | -1 | -4 | -7 | -11 | -19 | | | | | | | | | |
| 6 | 6 | 4 | 1 | -1 | -4 | -7 | -13 | -21 | | | | | | | | |
| 8 | 8 | 6 | 3 | 1 | -2 | -5 | -9 | -14 | | | | | | | | |
| 10 | 10 | 8 | 6 | 4 | 1 | -2 | -5 | -9 | -14 | -28 | | | | | | |
| 12 | 12 | 10 | 8 | 6 | 4 | 1 | -2 | -5 | -9 | -16 | | | | | | |
| 14 | 14 | 12 | 11 | 9 | 6 | 4 | 1 | -2 | -5 | -10 | -17 | | | | | |
| 16 | 16 | 14 | 13 | 11 | 9 | 7 | 4 | 1 | -1 | -6 | -10 | -17 | | | | |
| 18 | 18 | 16 | 15 | 13 | 11 | 9 | 7 | 4 | 2 | -2 | -5 | -10 | -19 | | | |
| 20 | 20 | 19 | 17 | 15 | 14 | 12 | 10 | 7 | 4 | 2 | -2 | -5 | -10 | -19 | | |
| 22 | 22 | 21 | 19 | 17 | 16 | 14 | 12 | 10 | 8 | 5 | 3 | -1 | -5 | -10 | -19 | |
| 24 | 24 | 23 | 21 | 20 | 18 | 16 | 14 | 12 | 10 | 8 | 6 | 2 | -1 | -5 | -10 | -18 |
| 26 | 26 | 25 | 23 | 22 | 20 | 18 | 17 | 15 | 13 | 11 | 9 | 6 | 3 | 0 | -4 | -9 |
| 28 | 28 | 27 | 25 | 24 | 22 | 21 | 19 | 17 | 16 | 14 | 11 | 9 | 7 | 4 | 1 | -3 |
| 30 | 30 | 29 | 27 | 26 | 24 | 23 | 21 | 19 | 18 | 16 | 14 | 12 | 10 | 8 | 5 | 1 |

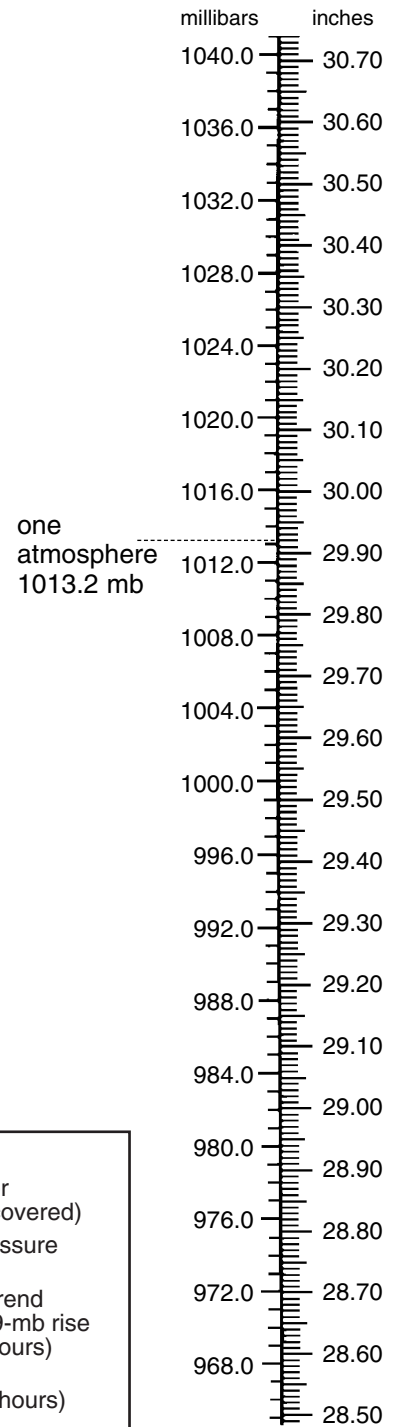
Relative Humidity (%)

| Dry-Bulb Temperature (°C) | Difference Between Wet-Bulb and Dry-Bulb Temperatures (C°) | | | | | | | | | | | | | | | |
|---------------------------|--|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| -20 | 100 | 28 | | | | | | | | | | | | | | |
| -18 | 100 | 40 | | | | | | | | | | | | | | |
| -16 | 100 | 48 | | | | | | | | | | | | | | |
| -14 | 100 | 55 | 11 | | | | | | | | | | | | | |
| -12 | 100 | 61 | 23 | | | | | | | | | | | | | |
| -10 | 100 | 66 | 33 | | | | | | | | | | | | | |
| -8 | 100 | 71 | 41 | 13 | | | | | | | | | | | | |
| -6 | 100 | 73 | 48 | 20 | | | | | | | | | | | | |
| -4 | 100 | 77 | 54 | 32 | 11 | | | | | | | | | | | |
| -2 | 100 | 79 | 58 | 37 | 20 | 1 | | | | | | | | | | |
| 0 | 100 | 81 | 63 | 45 | 28 | 11 | | | | | | | | | | |
| 2 | 100 | 83 | 67 | 51 | 36 | 20 | 6 | | | | | | | | | |
| 4 | 100 | 85 | 70 | 56 | 42 | 27 | 14 | | | | | | | | | |
| 6 | 100 | 86 | 72 | 59 | 46 | 35 | 22 | 10 | | | | | | | | |
| 8 | 100 | 87 | 74 | 62 | 51 | 39 | 28 | 17 | 6 | | | | | | | |
| 10 | 100 | 88 | 76 | 65 | 54 | 43 | 33 | 24 | 13 | 4 | | | | | | |
| 12 | 100 | 88 | 78 | 67 | 57 | 48 | 38 | 28 | 19 | 10 | 2 | | | | | |
| 14 | 100 | 89 | 79 | 69 | 60 | 50 | 41 | 33 | 25 | 16 | 8 | 1 | | | | |
| 16 | 100 | 90 | 80 | 71 | 62 | 54 | 45 | 37 | 29 | 21 | 14 | 7 | 1 | | | |
| 18 | 100 | 91 | 81 | 72 | 64 | 56 | 48 | 40 | 33 | 26 | 19 | 12 | 6 | | | |
| 20 | 100 | 91 | 82 | 74 | 66 | 58 | 51 | 44 | 36 | 30 | 23 | 17 | 11 | 5 | | |
| 22 | 100 | 92 | 83 | 75 | 68 | 60 | 53 | 46 | 40 | 33 | 27 | 21 | 15 | 10 | 4 | |
| 24 | 100 | 92 | 84 | 76 | 69 | 62 | 55 | 49 | 42 | 36 | 30 | 25 | 20 | 14 | 9 | 4 |
| 26 | 100 | 92 | 85 | 77 | 70 | 64 | 57 | 51 | 45 | 39 | 34 | 28 | 23 | 18 | 13 | 9 |
| 28 | 100 | 93 | 86 | 78 | 71 | 65 | 59 | 53 | 47 | 42 | 36 | 31 | 26 | 21 | 17 | 12 |
| 30 | 100 | 93 | 86 | 79 | 72 | 66 | 61 | 55 | 49 | 44 | 39 | 34 | 29 | 25 | 20 | 16 |

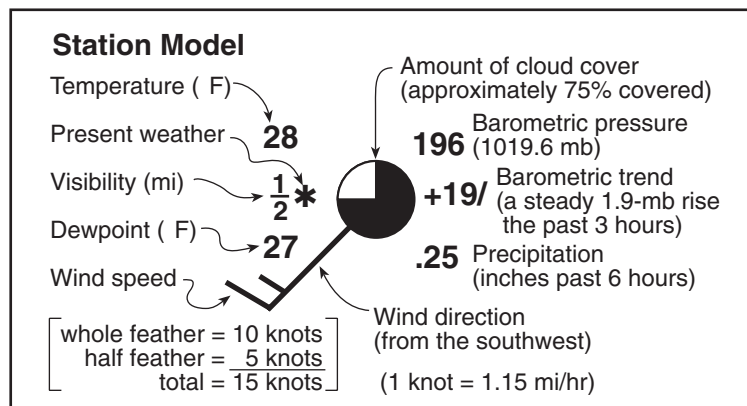
Temperature



Pressure

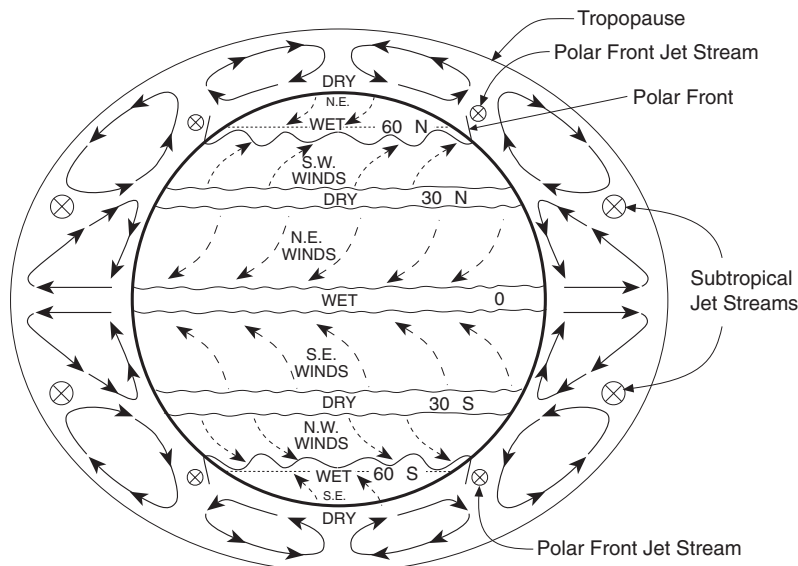
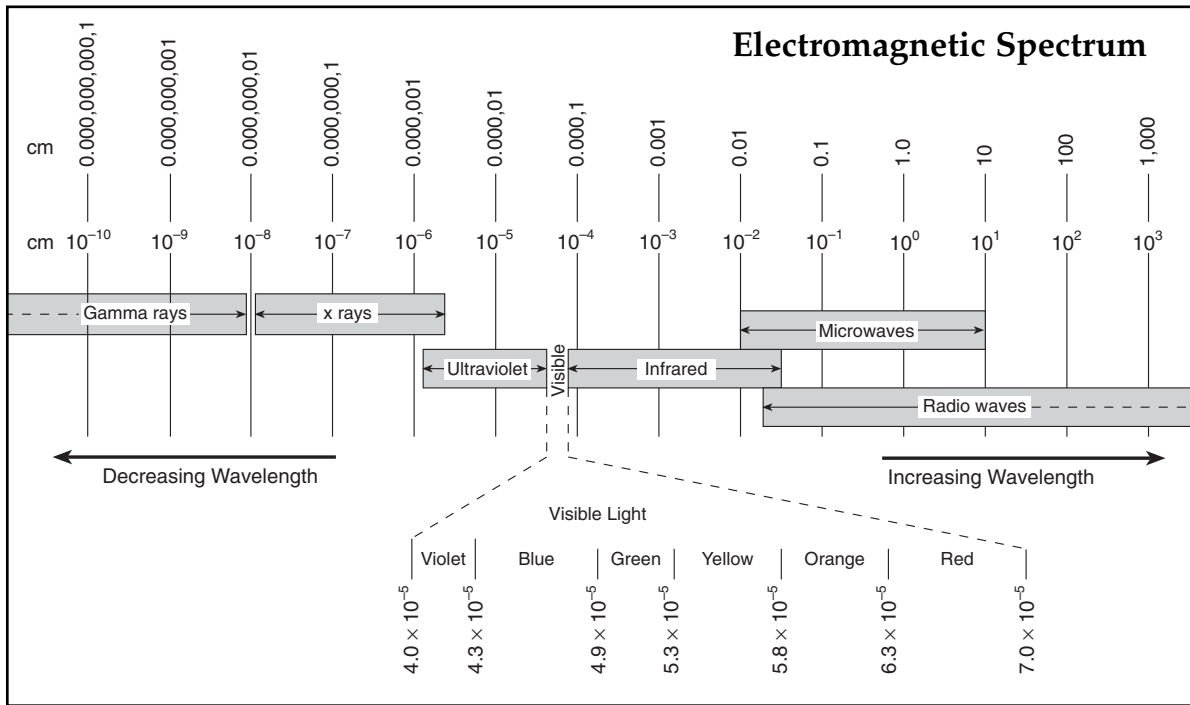
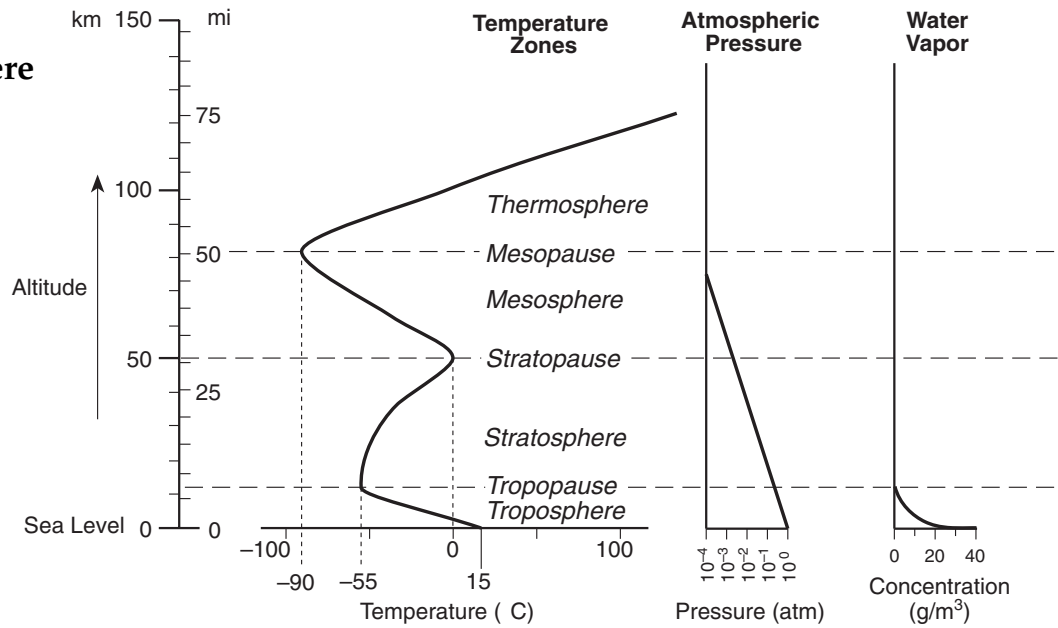


Weather Map Symbols



| Present Weather | | | | | | Air Masses | | | | Front Symbols | | | Hurricane |
|-----------------|------------|--------------------|-----------|--------------------|-------------------|-----------------------|----------------------|-------------------------|----------------------|-------------------|------|------|-----------|
| ☉ Drizzle | ● Rain | ☁ Smog | △ Hail | ⚡ Thunderstorms | ☂ Rain Showers | cA continental arctic | cP continental polar | cT continental tropical | mT maritime tropical | mP maritime polar | Cold | ▲▲▲▲ | ☉ |
| * | △ Sleet | ☂ Freezing Rain | = | ∞ | ☂* | Snow | Stationary | Occluded | Warm | ●●●● | | | |
| | | | | | | | | | | | Cold | ▲▲▲▲ | |
| | | | | | | | | | | | Warm | ●●●● | |

Selected Properties of Earth's Atmosphere

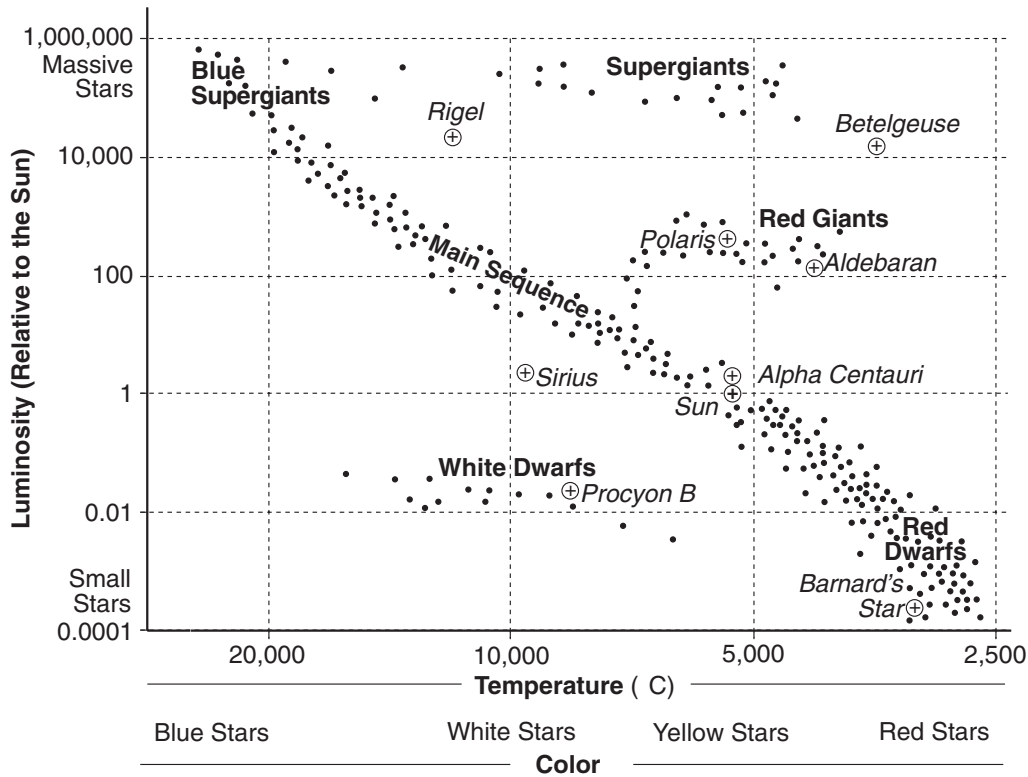


Planetary Wind and Moisture Belts in the Troposphere

The drawing to the left shows the locations of the belts near the time of an equinox. The locations shift somewhat with the changing latitude of the Sun's vertical ray. In the Northern Hemisphere, the belts shift northward in summer and southward in winter.

Luminosity and Temperature of Stars

(Name in italics refers to star shown by a ⊕)












Luminosity is the brightness of stars compared to the brightness of our Sun as seen from the same distance from the observer.

Solar System Data

| Object | Mean Distance from Sun (millions of km) | Period of Revolution | Period of Rotation | Eccentricity of Orbit | Equatorial Diameter (km) | Mass (Earth = 1) | Density (g/cm ³) | Number of Moons |
|--------------|---|----------------------|---------------------------|-----------------------|--------------------------|------------------|------------------------------|-----------------|
| SUN | — | — | 27 days | — | 1,392,000 | 333,000.00 | 1.4 | — |
| MERCURY | 57.9 | 88 days | 59 days | 0.206 | 4,880 | 0.553 | 5.4 | 0 |
| VENUS | 108.2 | 224.7 days | 243 days | 0.007 | 12,104 | 0.815 | 5.2 | 0 |
| EARTH | 149.6 | 365.26 days | 23 hr 56 min 4 sec | 0.017 | 12,756 | 1.00 | 5.5 | 1 |
| MARS | 227.9 | 687 days | 24 hr 37 min 23 sec | 0.093 | 6,787 | 0.1074 | 3.9 | 2 |
| JUPITER | 778.3 | 11.86 years | 9 hr 50 min 30 sec | 0.048 | 142,800 | 317.896 | 1.3 | 16 |
| SATURN | 1,427 | 29.46 years | 10 hr 14 min | 0.056 | 120,000 | 95.185 | 0.7 | 18 |
| URANUS | 2,869 | 84.0 years | 17 hr 14 min | 0.047 | 51,800 | 14.537 | 1.2 | 21 |
| NEPTUNE | 4,496 | 164.8 years | 16 hr | 0.009 | 49,500 | 17.151 | 1.7 | 8 |
| EARTH'S MOON | 149.6 (0.386 from Earth) | 27.3 days | 27 days 8 hr | 0.055 | 3,476 | 0.0123 | 3.3 | — |

Properties of Common Minerals

| LUSTER | HARD-NESS | CLEAVAGE FRACTURE | COMMON COLORS | DISTINGUISHING CHARACTERISTICS | USE(S) | MINERAL NAME | COMPOSITION* |
|--------------------|-----------|-----------------------|--|--|------------------------------------|---|--|
| Metallic Luster | 1–2 | ✓ | silver to gray | black streak, greasy feel | pencil lead, lubricants | Graphite | C |
| | 2.5 | ✓ | metallic silver | very dense (7.6 g/cm ³), gray-black streak  | ore of lead | Galena | PbS |
| | 5.5–6.5 | ✓ | black to silver | attracted by magnet, black streak | ore of iron | Magnetite | Fe ₃ O ₄ |
| | 6.5 | ✓ | brassy yellow | green-black streak, cubic crystals  | ore of sulfur | Pyrite | FeS ₂ |
| Either | 1–6.5 | ✓ | metallic silver or earthy red | red-brown streak | ore of iron | Hematite | Fe ₂ O ₃ |
| Nonmetallic Luster | 1 | ✓ | white to green | greasy feel | talcum powder, soapstone | Talc | Mg ₃ Si ₄ O ₁₀ (OH) ₂ |
| | 2 | ✓ | yellow to amber | easily melted, may smell | vulcanize rubber, sulfuric acid | Sulfur | S |
| | 2 | ✓ | white to pink or gray | easily scratched by fingernail | plaster of paris and drywall | Gypsum (Selenite) | CaSO ₄ •2H ₂ O |
| | 2–2.5 | ✓ | colorless to yellow | flexible in thin sheets  | electrical insulator | Muscovite Mica | KAl ₃ Si ₃ O ₁₀ (OH) ₂ |
| | 2.5 | ✓ | colorless to white | cubic cleavage, salty taste  | food additive, melts ice | Halite | NaCl |
| | 2.5–3 | ✓ | black to dark brown | flexible in thin sheets  | electrical insulator | Biotite Mica | K(Mg,Fe) ₃ AlSi ₃ O ₁₀ (OH) ₂ |
| | 3 | ✓ | colorless or variable | bubbles with acid  | cement, polarizing prisms | Calcite | CaCO ₃ |
| | 3.5 | ✓ | colorless or variable | bubbles with acid when powdered | source of magnesium | Dolomite | CaMg(CO ₃) ₂ |
| | 4 | ✓ | colorless or variable | cleaves in 4 directions | hydrofluoric acid | Fluorite | CaF ₂ |
| | 5–6 | ✓ | black to dark green | cleaves in 2 directions at 90°  | mineral collections | Pyroxene (commonly Augite) | (Ca,Na)(Mg,Fe,Al)(Si,Al) ₂ O ₆ |
| | 5.5 | ✓ | black to dark green | cleaves at 56° and 124°  | mineral collections | Amphiboles (commonly Hornblende) | CaNa(Mg,Fe) ₄ (Al,Fe,Ti) ₃ Si ₆ O ₂₂ (O,OH) ₂ |
| | 6 | ✓ | white to pink | cleaves in 2 directions at 90° | ceramics and glass | Potassium Feldspar (Orthoclase) | KAlSi ₃ O ₈ |
| | 6 | ✓ | white to gray | cleaves in 2 directions, striations visible | ceramics and glass | Plagioclase Feldspar (Na-Ca Feldspar) | (Na,Ca)AlSi ₃ O ₈ |
| | 6.5 | ✓ | green to gray or brown | commonly light green and granular | furnace bricks and jewelry | Olivine | (Fe,Mg) ₂ SiO ₄ |
| 7 | ✓ | colorless or variable | glassy luster, may form hexagonal crystals  | glass, jewelry, and electronics | Quartz | SiO ₂ | |
| 7 | ✓ | dark red to green | glassy luster, often seen as red grains in NYS metamorphic rocks | jewelry and abrasives | Garnet (commonly Almandine) | Fe ₃ Al ₂ Si ₃ O ₁₂ | |

*Chemical Symbols: Al = aluminum Cl = chlorine H = hydrogen Na = sodium S = sulfur
 C = carbon F = fluorine K = potassium O = oxygen Si = silicon
 Ca = calcium Fe = iron Mg = magnesium Pb = lead Ti = titanium

✓ = dominant form of breakage