|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Density (g/L) | Atomic Mass(amu) | Ist Ionization Energy(kJ) | Atomic Radii(pm) | Ionic Radii (pm) | Melt/Boil Point (oC) | Electronegativity |  |
|  Hydrogen | 0.09 | 1.0079 | 1312 | 37 |  | -259 /-252 | 2.20 |  |
|  Lithium | 0.53 | 6.941 | 520 | 152 |  | 180 / 1347 | 0.98 |  |
| Sodium | 0.97 | 22.990 | 496 | 186 |  | 98 / 883 | 0.93 |  |
| Potassium | 0.86 | 39.098 | 419 | 232 |  | 64 / 774 | 0.82 |  |
| Rubidium | 1.53 | 85.47 | 403 | 248 |  | 39 / 688 | 0.82 |  |
| Cesium | 1.9 | 132.90 | 376 | 265 |  | 29 / 678 | 0.79 |  |
| Francium |  | (223) | --- | 270 |  | 27 / 677 | 0.7 |  |
| Beryllium | 1.85 | 9.012 | 900 | 111 |  | 1278 / 2970 | 1.57 |  |
| Magnesium | 1.74 | 24.305 | 738 | 160 |  | 639 / 1090 | 1.31 |  |
| Calcium | 1.55 | 40.08 | 590 | 197 |  | 839 / 1484 | 1.00 |  |
| Strontium | 2.6 | 87.62 | 550 | 215 |  | 769 / 1384 | 0.95 |  |
| Barium | 3.5 | 137.33 | 503 | 217 |  | 725 / 1140 | 0.89 |  |
| Radium |  | (226) | 509 | 220 |  | 700 / 1737 | 0.9 |  |
| Boron | 2.4 | 10.811 | 801 | 86 |  | 2300 / 2550 | 2.04 |  |
| Aluminum | 2.7 | 26.982 | 578 | 143 |  | 660 / 2467 | 1.61 |  |
| Gallium | 5.91 | 69.723 | 579 | 135 |  | 30 / 2403 | 1.81 |  |
| Indium | 7.3 | 114.82 | 558 | 167 |  | 156 / 2000 | 1.78 |  |
| Thallium | 11.85 | 204.38 | 589 | 170 |  | 304 / 1457 | 2.04 |  |
| Carbon | 2.26 | 12.011 | 1086 | 77 |  | 3500 / 4827 | 2.55 |  |
| Silicon | 2.3 | 28.086 | 787 | 118 |  | 1410 / 2355 | 1.90 |  |
| Germanium | 5.36 | 72.61 | 762 | 128 |  | 937 / 2830 | 2.01 |  |
| Tin | 1.28 | 118.71 | 709 | 151 |  | 232 / 2270 | 1.96 |  |
| Lead | 11.34 | 207.2 | 716 | 175 |  | 328 / 1740 | 2.33 |  |
| Nitrogen | 1.25 | 14.007 | 1402 | 70 |  | -210 / -196 | 3.04 |  |
| Phosphorus | 1.82 | 30.974 | 1012 | 108 |  | 44.1 / 280 | 2.19 |  |
| Arsenic | 5.7 | 74.922 | 947 | 125 |  | 81@28atm / sublimes @613 | 2.18 |  |
| Antimony | 6.7 | 121.75 | 834 | 145 |  | 630 / 1750 | 2.05 |  |
| Bismuth | 9.8 | 208.98 | 703 | 155 |  | 271 / 1560 | 2.02 |  |
| Oxygen | 1.43 | 15.999 | 1314 | 73 |  | -218 / -183 | 3.44 |  |
| Sulfur | 2.07 | 32.066 | 1000 | 106 |  | 113 / 445 | 2.58 |  |
| Selenium | 4.8 | 78.96 | 941 | 116 |  | 217 / 685 | 2.55 |  |
| Tellurium | 6.2 | 127.60 | 869 | 142 |  | 450 / 990 | 2.1 |  |
| Polonium | 9.4 | (209) | 812 | 169 |  | 254 / 962 | 2.0 |  |
| Fluorine | 1.69 | 18.998 | 1681 | 72 |  | -220 / -188 | 3.98 |  |
| Chlorine | 3.2 | 35.453 | 1251 | 99 |  | -101 / -35 | 3.16 |  |
| Bromine | 3.11 | 79.904 | 1140 | 114 |  | -7.2 / 59 | 2.96 |  |
| Iodine | 4.93 | 126.90 | 1008 | 133 |  | 114 / 184 @35atm | 2.66 |  |
| Astatine |  | (210) | --- | 140 |  | 302 / 337 | 2.2 |  |
| Helium | 0.18 | 4.003 | 2372 | 32 |  |  | --- |  |
| Neon | 0.9 | 20.180 | 2081 | 71 |  |  | --- |  |
| Argon | 1.78 | 39.948 | 1521 | 97 |  |  | --- |  |
| Krypton | 3.74 | 83.80 | 1351 | 110 |  |  | --- |  |
| Xenon | 5.89 | 131.29 | 1170 | 130 |  |  | --- |  |
| Radon | 9.73 | (222) | 1038 | 141 |  |  | --- |  |

 Physical Data for the main block elements (s & p-orbitals) of the periodic table.

**TEACHER NOTES:** Physical Data for the main block elements (s & p-orbitals) of the periodic table.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Density (g/L)**1cm=1g/mL** | Atomic Mass(amu)**1cm=18 amu** | Ist Ionization Energy(kJ)**1 cm = 190 kJ** | Atomic Radii(pm)**1cm = 22 pm** | Ionic Radii (pm) | Melt/Boil Point (oC) | Electronegativity**1 cm = 0.32** |  |
|  **Hydrogen** | 0.09 | 1.0079 | 1312 | 37 |  | -259 /-252 | 2.20 |  |
|  **Lithium** | 0.53 | 6.941 | 520 | 152 |  | 180 / 1347 | 0.98 |  |
| **Sodium** | 0.97 | 22.990 | 496 | 186 |  | 98 / 883 | 0.93 |  |
| **Potassium** | 0.86 | 39.098 | 419 | 232 |  | 64 / 774 | 0.82 |  |
| **Rubidium** | 1.53 | 85.47 | 403 | 248 |  | 39 / 688 | 0.82 |  |
| **Cesium** | 1.9 | 132.90 | 376 | 265 |  | 29 / 678 | 0.79 |  |
| **Francium** |  | (223) | --- | 270 |  | 27 / 677 | 0.7 |  |
| **Beryllium** | 1.85 | 9.012 | 900 | 111 |  | 1278 / 2970 | 1.57 |  |
| **Magnesium** | 1.74 | 24.305 | 738 | 160 |  | 639 / 1090 | 1.31 |  |
| **Calcium** | 1.55 | 40.08 | 590 | 197 |  | 839 / 1484 | 1.00 |  |
| **Strontium** | 2.6 | 87.62 | 550 | 215 |  | 769 / 1384 | 0.95 |  |
| **Barium** | 3.5 | 137.33 | 503 | 217 |  | 725 / 1140 | 0.89 |  |
| **Radium** |  | (226) | 509 | 220 |  | 700 / 1737 | 0.9 |  |
| **Boron** | 2.4 | 10.811 | 801 | 86 |  | 2300 / 2550 | 2.04 |  |
| **Aluminum** | 2.7 | 26.982 | 578 | 143 |  | 660 / 2467 | 1.61 |  |
| **Gallium** | 5.91 | 69.723 | 579 | 135 |  | 30 / 2403 | 1.81 |  |
| **Indium** | 7.3 | 114.82 | 558 | 167 |  | 156 / 2000 | 1.78 |  |
| **Thallium** | 11.85 | 204.38 | 589 | 170 |  | 304 / 1457 | 2.04 |  |
| **Carbon** | 2.26 | 12.011 | 1086 | 77 |  | 3500 / 4827 | 2.55 |  |
| **Silicon** | 2.3 | 28.086 | 787 | 118 |  | 1410 / 2355 | 1.90 |  |
| **Germanium** | 5.36 | 72.61 | 762 | 128 |  | 937 / 2830 | 2.01 |  |
| **Tin** | 1.28 | 118.71 | 709 | 151 |  | 232 / 2270 | 1.96 |  |
| **Lead** | 11.34 | 207.2 | 716 | 175 |  | 328 / 1740 | 2.33 |  |
| **Nitrogen** | 1.25 | 14.007 | 1402 | 70 |  | -210 / -196 | 3.04 |  |
| **Phosphorus** | 1.82 | 30.974 | 1012 | 108 |  | 44.1 / 280 | 2.19 |  |
| **Arsenic** | 5.7 | 74.922 | 947 | 125 |  | 81@28atm / sublimes @613 | 2.18 |  |
| **Antimony** | 6.7 | 121.75 | 834 | 145 |  | 630 / 1750 | 2.05 |  |
| **Bismuth** | 9.8 | 208.98 | 703 | 155 |  | 271 / 1560 | 2.02 |  |
| **Oxygen** | 1.43 | 15.999 | 1314 | 73 |  | -218 / -183 | 3.44 |  |
| **Sulfur** | 2.07 | 32.066 | 1000 | 106 |  | 113 / 445 | 2.58 |  |
| **Selenium** | 4.8 | 78.96 | 941 | 116 |  | 217 / 685 | 2.55 |  |
| **Tellurium** | 6.2 | 127.60 | 869 | 142 |  | 450 / 990 | 2.1 |  |
| **Polonium** | 9.4 | (209) | 812 | 169 |  | 254 / 962 | 2.0 |  |
| **Fluorine** | 1.69 | 18.998 | 1681 | 72 |  | -220 / -188 | 3.98 |  |
| **Chlorine** | 3.2 | 35.453 | 1251 | 99 |  | -101 / -35 | 3.16 |  |
| **Bromine** | 3.11 | 79.904 | 1140 | 114 |  | -7.2 / 59 | 2.96 |  |
| **Iodine** | 4.93 | 126.90 | 1008 | 133 |  | 114 / 184 @35atm | 2.66 |  |
| **Astatine** |  | (210) | --- | 140 |  | 302 / 337 | 2.2 |  |
| **Helium** | 0.18 | 4.003 | 2372 | 32 |  |  | --- |  |
| **Neon** | 0.9 | 20.180 | 2081 | 71 |  |  | --- |  |
| **Argon** | 1.78 | 39.948 | 1521 | 97 |  |  | --- |  |
| **Krypton** | 3.74 | 83.80 | 1351 | 110 |  |  | --- |  |
| **Xenon** | 5.89 | 131.29 | 1170 | 130 |  |  | --- |  |
| **Radon** | 9.73 | (222) | 1038 | 141 |  |  | --- |  |

***TEACHER NOTES***

A Class of 24 students will require ~200 straws.

This activity can easily be completed in one class period.

A typical straw is 19 cm long. Flexible straws have 13.5 cm useable length.

 The 96 well-plate is 1 cm deep – therefore you have 12.5 cm of useable straw length as your largest value.

Use the following formula to calculate the conversion factor for straw length:

Largest value 12.5 cm

=

 X cm 1 cm

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The following are suggestions for scales for each trend:

 **Density** 1 cm of straw = 1 g/mL

 **Atomic Mass** 1 cm of straw = 18 amu

 **1st Ionization Energy** 1 cm of straw = 190 kJ

 **Atomic Radii** 1 cm of straw = 22 pm

 Ionic Radii 1 cm of straw = 22 pm

 **Electronegativity** 1 cm = 0.32

 Melting Point (may be too large of difference & negative values are difficult to show)

 Boiling Point (may be too large of difference & negative values are difficult to show)

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*