## Helium Atom

Z = 2 Atomic Mass : $M_{\mathrm{A}} = 4.002602$

$\sigma_a(\mathrm{Mb}) = 109.76097 \dfrac{\mathrm{d}f}{\mathrm{d}E}\ (\mathrm{eV}^{-1})$

$\mu_m = \sigma_a \cdot N_{\mathrm{A}} \cdot M_{\mathrm{A}}^{-1}$

Table I. Discrete oscillator strength, $f_n$.

| Energy (eV) | $f_n$ | $\lambda$ (Å) | Energy (eV) | $f_n$ | $\lambda$ (Å) |
|---|---|---|---|---|---|
| 2.1218E+01 | 2.7616E-01 | 5.8433E+02 | 2.4493E+01 | 1.0630E-03 | 5.0620E+02 |
| 2.3087E+01 | 7.3440E-02 | 5.3703E+02 | 2.4507E+01 | 8.3500E-04 | 5.0591E+02 |
| 2.3742E+01 | 2.9860E-02 | 5.2221E+02 | 2.4518E+01 | 6.6800E-04 | 5.0568E+02 |
| 2.4046E+01 | 1.5039E-02 | 5.1562E+02 | 2.4527E+01 | 5.4300E-04 | 5.0550E+02 |
| 2.4211E+01 | 8.6280E-03 | 5.1210E+02 | 2.4534E+01 | 4.4800E-04 | 5.0535E+02 |
| 2.4311E+01 | 5.4050E-03 | 5.1000E+02 | 2.4540E+01 | 3.7300E-04 | 5.0522E+02 |
| 2.4375E+01 | 3.6100E-03 | 5.0864E+02 | 2.4545E+01 | 3.1400E-04 | 5.0512E+02 |
| 2.4420E+01 | 2.5300E-03 | 5.0772E+02 | 2.4550E+01 | 2.6700E-04 | 5.0503E+02 |
| 2.4452E+01 | 1.8400E-03 | 5.0706E+02 | 2.4553E+01 | 2.2900E-04 | 5.0496E+02 |
| 2.4475E+01 | 1.3810E-03 | 5.0657E+02 | 2.4572E+01 | 2.0760E-03[a)] | 5.0457E+02 |

[a)] Represents $\sum_{n=21}^{\infty} f_n$ for the 1 $^1$S $\rightarrow$ $n$ $^1$P transitions.

Table II. Excess oscillator strength, $f_n$, for the two-electron excitation series.

| Energy (eV) | $f_n$ | $\lambda$ (Å) | Energy (eV) | $f_n$ | $\lambda$ (Å) |
|---|---|---|---|---|---|
| 6.0151E+01 | 4.8610E-03 | 2.0612E+02 | 6.2761E+01 | 3.2000E-05 | 1.9755E+02 |
| 6.3655E+01 | 8.0200E-04 | 1.9478E+02 | 6.4136E+01 | 5.0000E-06 | 1.9332E+02 |
| 6.4466E+01 | 3.3000E-04 | 1.9232E+02 | 6.4659E+01 | 4.0000E-06 | 1.9175E+02 |
| 6.4816E+01 | 1.3600E-04 | 1.9129E+02 | 7.1225E+01 | 5.8000E-05 | 1.7407E+02 |
| 6.4999E+01 | 7.8000E-05 | 1.9075E+02 | 7.2003E+01 | 6.7000E-05 | 1.7219E+02 |
| 6.5108E+01 | 4.9000E-05 | 1.9043E+02 | 7.2358E+01 | 4.8000E-05 | 1.7135E+02 |
| 6.5181E+01 | 2.9000E-05 | 1.9022E+02 | 7.2549E+01 | 5.0000E-06 | 1.7090E+02 |
| 6.5229E+01 | 1.9000E-05 | 1.9008E+02 | 7.1725E+01 | 2.0000E-06 | 1.7286E+02 |
| 6.5263E+01 | 1.0000E-05 | 1.8998E+02 | 7.2253E+01 | 6.3000E-05 | 1.7160E+02 |

Table III. Oscillator-strength density, $\mathrm{d}f/\mathrm{d}E$, photoabsorption cross section, $\sigma_{\mathrm{a}}$, and mass absorption coefficient, $\mu_{\mathrm{m}}$.

| Energy (eV) | $f_n$ ($\mathrm{eV}^{-1}$) | $\sigma_a$ (Mb) | $\mu_{\mathrm{m}}$ ($\mathrm{cm}^2\ \mathrm{g}^{-1}$) | $\lambda$ (Å) |
|---|---|---|---|---|
| 2.4587E+01 | 6.7610E-02 | 7.4209E+00 | 1.1165E+06 | 5.0426E+02 |
| 2.5000E+01 | 6.5821E-02 | 7.2246E+00 | 1.0870E+06 | 4.9594E+02 |
| 2.7500E+01 | 5.6468E-02 | 6.1980E+00 | 9.3252E+05 | 4.5085E+02 |
| 3.0000E+01 | 4.8924E-02 | 5.3699E+00 | 8.0794E+05 | 4.1328E+02 |
| 3.5000E+01 | 3.7351E-02 | 4.0997E+00 | 6.1682E+05 | 3.5424E+02 |
| 4.0000E+01 | 2.9021E-02 | 3.1854E+00 | 4.7926E+05 | 3.0996E+02 |
| 4.5000E+01 | 2.2918E-02 | 2.5155E+00 | 3.7848E+05 | 2.7552E+02 |
| 5.0000E+01 | 1.8381E-02 | 2.0175E+00 | 3.0355E+05 | 2.4797E+02 |
| 6.0000E+01 | 1.2330E-02 | 1.3534E+00 | 2.0362E+05 | 2.0664E+02 |
| 7.0000E+01 | 8.6780E-03 | 9.5251E-01 | 1.4331E+05 | 1.7712E+02 |
| 8.0000E+01 | 6.3532E-03 | 6.9733E-01 | 1.0492E+05 | 1.5498E+02 |
| 9.0000E+01 | 4.8043E-03 | 5.2732E-01 | 7.9338E+04 | 1.3776E+02 |
| 1.0000E+02 | 3.7319E-03 | 4.0962E-01 | 6.1629E+04 | 1.2398E+02 |
| 1.2500E+02 | 2.0218E-03 | 2.2192E-01 | 3.3389E+04 | 9.9187E+01 |
| 1.5000E+02 | 1.2084E-03 | 1.3264E-01 | 1.9956E+04 | 8.2656E+01 |
| 1.7500E+02 | 7.7471E-04 | 8.5033E-02 | 1.2794E+04 | 7.0848E+01 |
| 2.0000E+02 | 5.2372E-04 | 5.7484E-02 | 8.6487E+03 | 6.1992E+01 |
| 2.2500E+02 | 3.6900E-04 | 4.0502E-02 | 6.0938E+03 | 5.5104E+01 |
| 2.5000E+02 | 2.6876E-04 | 2.9499E-02 | 4.4383E+03 | 4.9594E+01 |
| 2.7500E+02 | 2.0113E-04 | 2.2076E-02 | 3.3215E+03 | 4.5085E+01 |
| 3.0000E+02 | 1.5546E-04 | 1.7064E-02 | 2.5673E+03 | 4.1328E+01 |
| 3.5000E+02 | 9.7190E-05 | 1.0668E-02 | 1.6050E+03 | 3.5424E+01 |
| 4.0000E+02 | 6.4595E-05 | 7.0900E-03 | 1.0667E+03 | 3.0996E+01 |
| 4.5000E+02 | 4.4955E-05 | 4.9343E-03 | 7.4240E+02 | 2.7552E+01 |
| 5.0000E+02 | 3.2434E-05 | 3.5600E-03 | 5.3563E+02 | 2.4797E+01 |
| 6.0000E+02 | 1.8321E-05 | 2.0109E-03 | 3.0255E+02 | 2.0664E+01 |
| 7.0000E+02 | 1.1216E-05 | 1.2311E-03 | 1.8522E+02 | 1.7712E+01 |
| 8.0000E+02 | 7.2794E-06 | 7.9900E-04 | 1.2021E+02 | 1.5498E+01 |
| 9.0000E+02 | 4.9381E-06 | 5.4202E-04 | 8.1549E+01 | 1.3776E+01 |
| 1.0000E+03 | 3.5053E-06 | 3.8475E-04 | 5.7888E+01 | 1.2398E+01 |
| 1.2500E+03 | 1.7167E-06 | 1.8843E-04 | 2.8350E+01 | 9.9187E+00 |
| 1.5000E+03 | 9.5319E-07 | 1.0462E-04 | 1.5741E+01 | 8.2656E+00 |
| 1.7500E+03 | 5.7707E-07 | 6.3339E-05 | 9.5298E+00 | 7.0848E+00 |
| 2.0000E+03 | 3.7208E-07 | 4.0840E-05 | 6.1446E+00 | 6.1992E+00 |
| 2.2500E+03 | 2.5165E-07 | 2.7622E-05 | 4.1559E+00 | 5.5104E+00 |
| 2.5000E+03 | 1.7669E-07 | 1.9394E-05 | 2.9179E+00 | 4.9594E+00 |

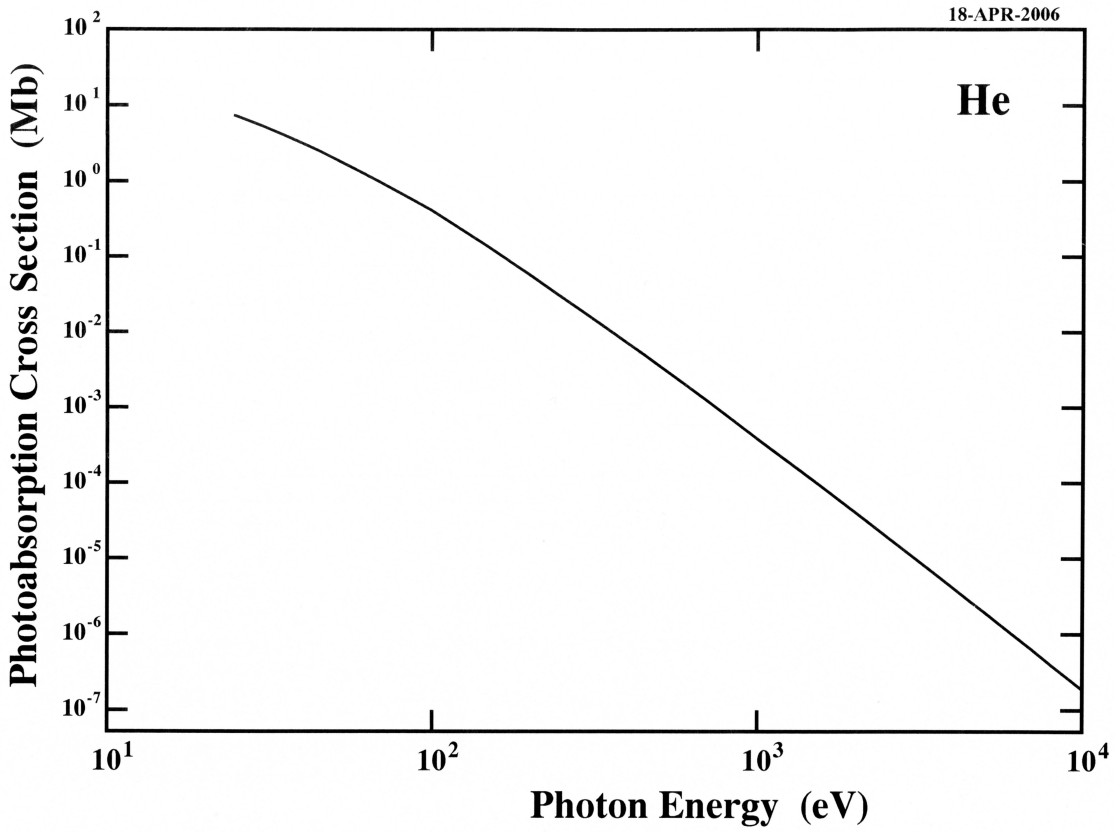
Table III. Oscillator-strength density, $\mathrm{d}f/\mathrm{d}E$, photoabsorption cross section, $\sigma_{\mathrm{a}}$, and mass absorption coefficient, $\mu_{\mathrm{m}}$. (Continued)

| Energy (eV) | $f_n$ ($\mathrm{eV}^{-1}$) | $\sigma_a$ (Mb) | $\mu_{\mathrm{m}}$ ($\mathrm{cm}^2\ \mathrm{g}^{-1}$) | $\lambda$ (Å) |
|---|---|---|---|---|
| 2.7500E+03 | 1.2783E-07 | 1.4031E-05 | 2.1110E+00 | 4.5085E+00 |
| 3.0000E+03 | 9.7155E-08 | 1.0664E-05 | 1.6044E+00 | 4.1328E+00 |
| 3.5000E+03 | 5.8332E-08 | 6.4026E-06 | 9.6331E-01 | 3.5424E+00 |
| 4.0000E+03 | 3.7350E-08 | 4.0995E-06 | 6.1680E-01 | 3.0996E+00 |
| 4.5000E+03 | 2.5158E-08 | 2.7614E-06 | 4.1546E-01 | 2.7552E+00 |
| 5.0000E+03 | 1.7651E-08 | 1.9374E-06 | 2.9149E-01 | 2.4797E+00 |
| 6.0000E+03 | 9.5493E-09 | 1.0481E-06 | 1.5770E-01 | 2.0664E+00 |
| 7.0000E+03 | 5.6790E-09 | 6.2333E-07 | 9.3784E-02 | 1.7712E+00 |
| 8.0000E+03 | 3.6206E-09 | 3.9740E-07 | 5.9792E-02 | 1.5498E+00 |
| 9.0000E+03 | 2.4344E-09 | 2.6720E-07 | 4.0202E-02 | 1.3776E+00 |
| 1.0000E+04 | 1.7068E-09 | 1.8734E-07 | 2.8186E-02 | 1.2398E+00 |
| 1.2500E+04 | .80404E-10 | 8.8252E-08 | 1.3278E-02 | 9.9187E-01 |
| 1.5000E+04 | .42443E-10 | 4.6586E-08 | 7.0091E-03 | 8.2656E-01 |
| 1.7500E+04 | .25075E-10 | 2.7522E-08 | 4.1409E-03 | 7.0848E-01 |
| 2.0000E+04 | .15883E-10 | 1.7433E-08 | 2.6229E-03 | 6.1992E-01 |
| 2.2500E+04 | .10611E-10 | 1.1647E-08 | 1.7524E-03 | 5.5104E-01 |
| 2.5000E+04 | .73945E-11 | 8.1163E-09 | 1.2211E-03 | 4.9594E-01 |
| 2.7500E+04 | .53318E-11 | 5.8523E-09 | 8.8051E-04 | 4.5085E-01 |
| 3.0000E+04 | .39546E-11 | 4.3406E-09 | 6.5307E-04 | 4.1328E-01 |
| 3.5000E+04 | .23278E-11 | 2.5551E-09 | 3.8442E-04 | 3.5424E-01 |
| 4.0000E+04 | .14701E-11 | 1.6136E-09 | 2.4277E-04 | 3.0996E-01 |
| 4.5000E+04 | .97973E-12 | 1.0754E-09 | 1.6179E-04 | 2.7552E-01 |
| 5.0000E+04 | .68128E-12 | 7.4778E-10 | 1.1251E-04 | 2.4797E-01 |
| 6.0000E+04 | .36310E-12 | 3.9854E-10 | 5.9962E-05 | 2.0664E-01 |
| 7.0000E+04 | .21315E-12 | 2.3396E-10 | 3.5200E-05 | 1.7712E-01 |
| 8.0000E+04 | .13432E-12 | 1.4743E-10 | 2.2181E-05 | 1.5498E-01 |
| 9.0000E+04 | .89350E-13 | 9.8071E-11 | 1.4755E-05 | 1.3776E-01 |
| 1.0000E+05 | .62035E-13 | 6.8090E-11 | 1.0245E-05 | 1.2398E-01 |

When photon energy is higher than 13 600 eV, the oscillator-strength density, $\mathrm{d}f/\mathrm{d}E$, in Rydberg units is given by

$$\mathrm{d}f/\mathrm{d}E \;=\; 308.98E^{-3.5} - 1941.38E^{-4} + 7082.8E^{-4.5}.$$

Here $E$ is photon energy in Rydberg units.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Photoabsorption Cross Section (Mb)
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$10^{1}$
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Photon Energy (eV)