

# Oxygen Atom

$Z = 8$

Atomic Mass = 15.9994

$$\sigma_a(\text{Mb}) = 109.76097 \frac{df}{dE} (\text{eV}^{-1})$$

$$\mu_m = \sigma_a \cdot N_A \cdot M_A^{-1}$$

Table I. Discrete oscillator strength,  $f_n$ , for discrete transitions.

Energy (eV)	$f_n$	$\lambda$ (Å)	Energy (eV)	$f_n$	$\lambda$ (Å)
9.5100E+00	5.1900E-02	1.3037E+03	1.3060E+01	6.3100E-03	9.4934E+02
1.1920E+01	9.1600E-03	1.0401E+03	1.3220E+01	8.7700E-04	9.3785E+02
1.2080E+01	2.0100E-02	1.0264E+03	1.3230E+01	3.6300E-03	9.3714E+02
1.2540E+01	5.5300E-02	9.8871E+02	1.3320E+01	5.3700E-04	9.3081E+02
1.2690E+01	3.3100E-03	9.7702E+02	1.3330E+01	2.3000E-03	9.3011E+02
1.2760E+01	1.3800E-02	9.7166E+02	1.3390E+01	1.5400E-03	9.2595E+02
1.3040E+01	1.5700E-03	9.5080E+02	1.3606E+01	2.8100E-03	9.1127E+02

Table II. Discrete oscillator strength,  $f_n$ , for autoionizing transitions.

Energy (eV)	$f_n$	$\lambda$ (Å)	Energy (eV)	$f_n$	$\lambda$ (Å)
1.4120E+01	8.0000E-02	8.7807E+02	1.6730E+01	2.0000E-03	7.4109E+02
1.5180E+01	9.0000E-03	8.1676E+02	1.6780E+01	1.0000E-03	7.3888E+02
1.5290E+01	3.8000E-03	8.1088E+02	1.6800E+01	1.0000E-03	7.3800E+02
1.5400E+01	9.3000E-03	8.0509E+02	1.6840E+01	2.5000E-03	7.3625E+02
1.5650E+01	6.6000E-02	7.9223E+02	1.7100E+01	7.4000E-03	7.2505E+02
1.6000E+01	2.9000E-03	7.7490E+02	1.7690E+01	1.7000E-03	7.0087E+02
1.6100E+01	1.7900E-02	7.7009E+02	1.7790E+01	3.4000E-03	6.9693E+02
1.6400E+01	8.5000E-03	7.5600E+02	1.8070E+01	2.6000E-03	6.8613E+02
1.6570E+01	4.1000E-03	7.4824E+02	1.8230E+01	1.2000E-03	6.8011E+02
1.6660E+01	3.0000E-03	7.4420E+02	1.8340E+01	6.0000E-04	6.7603E+02

Table III. Discrete oscillator strength,  $f_n$ , for the resonance transitions.

Energy (eV)	$f_n$	$\lambda$ (Å)	Energy (eV)	$f_n$	$\lambda$ (Å)
5.2700E+02	4.5200E-02	2.3526E+01	5.4400E+02	1.0560E-03	2.2791E+01
5.4120E+02	4.8300E-03	2.2909E+01	5.4880E+02	9.3900E-04	2.2592E+01
5.4585E+02	3.7400E-03	2.2714E+01	5.4450E+02	4.5210E-03	2.2770E+01
5.4268E+02	1.6790E-03	2.2847E+01	5.4700E+02	1.1500E-02	2.2666E+01
5.4746E+02	1.4040E-03	2.2647E+01	5.5050E+02	1.4850E-02	2.2522E+01

Table III. Oscillator-strength density,  $df/dE$ , photoabsorption cross section,  $\sigma_a$ , and mass absorption coefficient,  $\mu_m$ .

Energy (eV)	$f_n$ (eV <sup>-1</sup> )	$\sigma_a$ (Mb)	$\mu_m$ (cm <sup>2</sup> g <sup>-1</sup> )	$\lambda$ (Å)
1.3617E+01	6.3775E-03	7.0000E-01	2.6348E+04	9.1050E+02
1.3625E+01	1.0477E-02	1.1500E+00	4.3286E+04	9.1000E+02
1.3628E+01	2.2321E-02	2.4500E+00	9.2218E+04	9.0980E+02
1.3662E+01	2.5054E-02	2.7500E+00	1.0351E+05	9.0750E+02
1.3700E+01	2.5054E-02	2.7500E+00	1.0351E+05	9.0500E+02
1.3776E+01	2.5966E-02	2.8500E+00	1.0727E+05	9.0000E+02
1.3853E+01	2.5054E-02	2.7500E+00	1.0351E+05	8.9500E+02
1.3931E+01	2.4599E-02	2.7000E+00	1.0163E+05	8.9000E+02
1.4010E+01	2.5966E-02	2.8500E+00	1.0727E+05	8.8500E+02
1.4251E+01	2.8243E-02	3.1000E+00	1.1668E+05	8.7000E+02
1.4333E+01	2.8243E-02	3.1000E+00	1.1668E+05	8.6500E+02
1.4417E+01	2.8243E-02	3.1000E+00	1.1668E+05	8.6000E+02
1.4501E+01	2.8243E-02	3.1000E+00	1.1668E+05	8.5500E+02
1.4586E+01	2.9154E-02	3.2000E+00	1.2045E+05	8.5000E+02
1.4673E+01	2.9610E-02	3.2500E+00	1.2233E+05	8.4500E+02
1.4760E+01	3.0065E-02	3.3000E+00	1.2421E+05	8.4000E+02
1.4848E+01	3.0065E-02	3.3000E+00	1.2421E+05	8.3500E+02
1.4938E+01	3.0065E-02	3.3000E+00	1.2421E+05	8.3000E+02
1.5028E+01	3.0065E-02	3.3000E+00	1.2421E+05	8.2500E+02
1.5794E+01	3.3710E-02	3.7000E+00	1.3927E+05	7.8500E+02
1.5895E+01	3.3710E-02	3.7000E+00	1.3927E+05	7.8000E+02
1.6207E+01	3.6443E-02	4.0000E+00	1.5056E+05	7.6500E+02
1.6309E+01	3.6989E-02	4.0600E+00	1.5282E+05	7.6022E+02
1.6314E+01	3.5532E-02	3.9000E+00	1.4680E+05	7.6000E+02
1.6481E+01	3.7809E-02	4.1500E+00	1.5621E+05	7.5230E+02
1.6933E+01	4.0087E-02	4.4000E+00	1.6562E+05	7.3220E+02
1.6933E+01	7.3159E-02	8.0300E+00	3.0225E+05	7.3220E+02
1.6970E+01	7.6530E-02	8.4000E+00	3.1617E+05	7.3060E+02
1.7007E+01	8.3545E-02	9.1700E+00	3.4516E+05	7.2900E+02
1.7042E+01	8.1085E-02	8.9000E+00	3.3499E+05	7.2750E+02
1.7160E+01	8.2179E-02	9.0200E+00	3.3951E+05	7.2250E+02
1.7199E+01	8.1176E-02	8.9100E+00	3.3537E+05	7.2090E+02
1.7220E+01	8.1996E-02	9.0000E+00	3.3876E+05	7.2000E+02
1.7239E+01	8.1996E-02	9.0000E+00	3.3876E+05	7.1920E+02
1.7278E+01	8.0083E-02	8.7900E+00	3.3085E+05	7.1760E+02
1.7323E+01	8.4183E-02	9.2400E+00	3.4779E+05	7.1570E+02

Table III. Oscillator-strength density,  $df/dE$ , photoabsorption cross section,  $\sigma_a$ , and mass absorption coefficient,  $\mu_m$ . (Continued)

Energy (eV)	$f_n$ (eV <sup>-1</sup> )	$\sigma_a$ (Mb)	$\mu_m$ (cm <sup>2</sup> g <sup>-1</sup> )	$\lambda$ (Å)
1.7362E+01	8.3636E-02	9.1800E+00	3.4553E+05	7.1410E+02
1.7401E+01	8.4365E-02	9.2600E+00	3.4854E+05	7.1250E+02
1.7443E+01	8.4730E-02	9.3000E+00	3.5005E+05	7.1080E+02
1.7463E+01	8.3363E-02	9.1500E+00	3.4440E+05	7.1000E+02
1.7482E+01	8.8465E-02	9.7100E+00	3.6548E+05	7.0920E+02
1.7522E+01	9.0014E-02	9.8800E+00	3.7188E+05	7.0760E+02
1.7564E+01	8.8465E-02	9.7100E+00	3.6548E+05	7.0590E+02
1.7586E+01	8.7463E-02	9.6000E+00	3.6134E+05	7.0500E+02
1.7832E+01	8.2543E-02	9.0600E+00	3.4102E+05	6.9530E+02
1.7870E+01	8.1996E-02	9.0000E+00	3.3876E+05	6.9380E+02
1.7904E+01	8.7463E-02	9.6000E+00	3.6134E+05	6.9250E+02
1.7912E+01	8.6643E-02	9.5100E+00	3.5795E+05	6.9220E+02
1.7953E+01	8.6278E-02	9.4700E+00	3.5645E+05	6.9060E+02
1.7969E+01	8.9285E-02	9.8000E+00	3.6887E+05	6.9000E+02
1.8129E+01	8.4274E-02	9.2500E+00	3.4817E+05	6.8390E+02
1.8153E+01	8.7918E-02	9.6500E+00	3.6322E+05	6.8300E+02
1.8158E+01	8.8283E-02	9.6900E+00	3.6473E+05	6.8280E+02
1.8300E+01	9.1107E-02	1.0000E+01	3.7640E+05	6.7750E+02
1.8636E+01	8.9285E-02	9.8000E+00	3.6887E+05	6.6530E+02
1.8636E+01	1.0933E-01	1.2000E+01	4.5168E+05	6.6530E+02
1.8785E+01	1.1479E-01	1.2600E+01	4.7426E+05	6.6000E+02
1.9074E+01	1.1844E-01	1.3000E+01	4.8932E+05	6.5000E+02
1.9373E+01	1.2117E-01	1.3300E+01	5.0061E+05	6.4000E+02
1.9680E+01	1.2208E-01	1.3400E+01	5.0437E+05	6.3000E+02
1.9997E+01	1.2208E-01	1.3400E+01	5.0437E+05	6.2000E+02
2.0325E+01	1.2208E-01	1.3400E+01	5.0437E+05	6.1000E+02
2.0664E+01	1.2117E-01	1.3300E+01	5.0061E+05	6.0000E+02
2.1014E+01	1.2026E-01	1.3200E+01	4.9685E+05	5.9000E+02
2.1377E+01	1.1844E-01	1.3000E+01	4.8932E+05	5.8000E+02
2.1752E+01	1.1753E-01	1.2900E+01	4.8555E+05	5.7000E+02
2.2140E+01	1.1571E-01	1.2700E+01	4.7803E+05	5.6000E+02
2.2543E+01	1.1388E-01	1.2500E+01	4.7050E+05	5.5000E+02
2.2960E+01	1.1206E-01	1.2300E+01	4.6297E+05	5.4000E+02
2.3393E+01	1.1024E-01	1.2100E+01	4.5544E+05	5.3000E+02
2.3843E+01	1.0933E-01	1.2000E+01	4.5168E+05	5.2000E+02
2.4311E+01	1.0842E-01	1.1900E+01	4.4791E+05	5.1000E+02

Table III. Oscillator-strength density,  $df/dE$ , photoabsorption cross section,  $\sigma_a$ , and mass absorption coefficient,  $\mu_m$ . (Continued)

Energy (eV)	$f_n$ (eV <sup>-1</sup> )	$\sigma_a$ (Mb)	$\mu_m$ (cm <sup>2</sup> g <sup>-1</sup> )	$\lambda$ (Å)
2.4797E+01	1.0842E-01	1.1900E+01	4.4791E+05	5.0000E+02
2.5303E+01	1.0933E-01	1.2000E+01	4.5168E+05	4.9000E+02
2.7500E+01	1.0584E-01	1.1618E+01	4.3728E+05	4.5085E+02
3.0000E+01	1.0276E-01	1.1279E+01	4.2453E+05	4.1328E+02
3.5000E+01	8.6247E-02	9.4665E+00	3.5632E+05	3.5424E+02
4.0000E+01	7.1687E-02	7.8685E+00	2.9617E+05	3.0996E+02
4.5000E+01	6.1282E-02	6.7264E+00	2.5318E+05	2.7552E+02
5.0000E+01	5.2724E-02	5.7870E+00	2.1782E+05	2.4797E+02
6.0000E+01	4.0268E-02	4.4198E+00	1.6636E+05	2.0664E+02
7.0000E+01	3.0997E-02	3.4023E+00	1.2806E+05	1.7712E+02
8.0000E+01	2.4162E-02	2.6520E+00	9.9821E+04	1.5498E+02
9.0000E+01	1.9116E-02	2.0982E+00	7.8975E+04	1.3776E+02
1.0000E+02	1.5355E-02	1.6854E+00	6.3439E+04	1.2398E+02
1.2500E+02	9.4364E-03	1.0357E+00	3.8985E+04	9.9187E+01
1.5000E+02	6.2343E-03	6.8428E-01	2.5756E+04	8.2656E+01
1.7500E+02	4.3574E-03	4.7828E-01	1.8002E+04	7.0848E+01
2.0000E+02	3.1832E-03	3.4939E-01	1.3151E+04	6.1992E+01
2.2500E+02	2.4088E-03	2.6439E-01	9.9517E+03	5.5104E+01
2.5000E+02	1.8757E-03	2.0588E-01	7.7493E+03	4.9594E+01
2.7500E+02	1.4955E-03	1.6415E-01	6.1785E+03	4.5085E+01
3.0000E+02	1.2012E-03	1.3184E-01	4.9626E+03	4.1328E+01
3.5000E+02	8.1762E-04	8.9743E-02	3.3779E+03	3.5424E+01
4.0000E+02	5.8213E-04	6.3895E-02	2.4050E+03	3.0996E+01
4.5000E+02	4.3047E-04	4.7249E-02	1.7784E+03	2.7552E+01
5.0000E+02	3.2850E-04	3.6057E-02	1.3572E+03	2.4797E+01
5.5250E+02	2.5439E-04	2.7922E-02	1.0510E+03	2.2441E+01
5.5250E+02	4.7376E-03	5.2000E-01	1.9573E+04	2.2441E+01
6.0000E+02	4.0547E-03	4.4505E-01	1.6752E+04	2.0664E+01
7.0000E+02	2.7714E-03	3.0419E-01	1.1450E+04	1.7712E+01
8.0000E+02	1.9843E-03	2.1780E-01	8.1978E+03	1.5498E+01
9.0000E+02	1.4702E-03	1.6137E-01	6.0740E+03	1.3776E+01
1.0000E+03	1.1192E-03	1.2284E-01	4.6238E+03	1.2398E+01
1.2500E+03	6.1900E-04	6.7942E-02	2.5573E+03	9.9187E+00
1.5000E+03	3.7623E-04	4.1296E-02	1.5544E+03	8.2656E+00
1.7500E+03	2.4474E-04	2.6862E-02	1.0111E+03	7.0848E+00
2.0000E+03	1.6757E-04	1.8393E-02	6.9230E+02	6.1992E+00

Table III. Oscillator-strength density,  $df/dE$ , photoabsorption cross section,  $\sigma_a$ , and mass absorption coefficient,  $\mu_m$ . (Continued)

Energy (eV)	$f_n$ (eV <sup>-1</sup> )	$\sigma_a$ (Mb)	$\mu_m$ (cm <sup>2</sup> g <sup>-1</sup> )	$\lambda$ (Å)
2.2500E+03	1.1943E-04	1.3109E-02	4.9341E+02	5.5104E+00
2.5000E+03	8.7906E-05	9.6486E-03	3.6317E+02	4.9594E+00
2.7500E+03	7.7197E-05	8.4732E-03	3.1893E+02	4.5085E+00
3.0000E+03	5.8920E-05	6.4671E-03	2.4342E+02	4.1328E+00
3.5000E+03	3.6536E-05	4.0102E-03	1.5094E+02	3.5424E+00
4.0000E+03	2.4152E-05	2.6509E-03	9.9781E+01	3.0996E+00
4.5000E+03	1.6755E-05	1.8390E-03	6.9220E+01	2.7552E+00
5.0000E+03	1.2070E-05	1.3248E-03	4.9866E+01	2.4797E+00
6.0000E+03	6.8239E-06	7.4900E-04	2.8192E+01	2.0664E+00
7.0000E+03	4.1976E-06	4.6073E-04	1.7342E+01	1.7712E+00
8.0000E+03	2.7454E-06	3.0134E-04	1.1342E+01	1.5498E+00
9.0000E+03	1.8812E-06	2.0648E-04	7.7720E+00	1.3776E+00
1.0000E+04	1.2956E-06	1.4221E-04	5.3527E+00	1.2398E+00
1.2500E+04	6.3555E-07	6.9759E-05	2.6257E+00	9.9187E-01
1.5000E+04	3.5509E-07	3.8975E-05	1.4670E+00	8.2656E-01
1.7500E+04	2.1708E-07	2.3827E-05	8.9683E-01	7.0848E-01
2.0000E+04	1.4173E-07	1.5557E-05	5.8555E-01	6.1992E-01
2.2500E+04	9.7312E-08	1.0681E-05	4.0203E-01	5.5104E-01
2.5000E+04	6.9518E-08	7.6304E-06	2.8721E-01	4.9594E-01
2.7500E+04	5.1142E-08	5.6134E-06	2.1129E-01	4.5085E-01
3.0000E+04	3.8477E-08	4.2232E-06	1.5896E-01	4.1328E-01
3.5000E+04	2.3222E-08	2.5488E-06	9.5938E-02	3.5424E-01
4.0000E+04	1.4996E-08	1.6460E-06	6.1956E-02	3.0996E-01
4.5000E+04	1.0197E-08	1.1192E-06	4.2127E-02	2.7552E-01
5.0000E+04	7.2215E-09	7.9264E-07	2.9835E-02	2.4797E-01
6.0000E+04	3.9751E-09	4.3632E-07	1.6423E-02	2.0664E-01
7.0000E+04	2.3997E-09	2.6339E-07	9.9140E-03	1.7712E-01
8.0000E+04	1.5490E-09	1.7002E-07	6.3997E-03	1.5498E-01
9.0000E+04	1.0520E-09	1.1547E-07	4.3464E-03	1.3776E-01
1.0000E+05	7.4386E-10	8.1647E-08	3.0732E-03	1.2398E-01

When photon energy,  $E$ , is higher than  $10^5$  eV, the photoabsorption cross section,  $\sigma_a$ , in Mb is given by

$$\sigma_a = 680 (Z - 0.3)^6 \left( \frac{Ry}{E} \right)^4 \frac{\exp[-4\chi \arctan(\chi^{-1})]}{1 - \exp(-2\pi\chi)} .$$

Here  $E$  represents photon energy in eV and  $\chi$  is given by

$$\chi = \sqrt{\frac{E_K}{E - E_K}} ,$$

where  $E_K = 543.9$  eV.

