Reaction ^{18}O(p,α)^{15}N

A total of 50 resonances between E_r = 20 and 6746 keV [CA61, YA62, MA78b, LO79, WI82, CH86a, BE95] are considered for the calculation of the reaction rates. The resonances at 20, 143.5 and 656 keV dominate the rates. The E_r = 20 keV resonance strength is based on proton spectroscopic factors ($\omega\gamma \approx \omega\Gamma_p$) extracted by DWBA analysis from (^{3}He,d) tranfer reactions [SC70, CH86a] and from direct capture measurements [WI80]. A large part of the error on the reaction rates comes from the energy determination of that resonance. The resonance at E_r = 143.5 keV is fairly well established. The broad resonance at E_r = 655.8 keV gives strong contributions both at low and high temperatures. The total width of that high energy resonance is badly known. The two sets of widths available from YA62 and LO79 are used for numerical integration, and the average of the resulting rates is adopted. For the other broad resonance at E_r = 799 keV, which gives a significant contribution at high temperatures, the partial widths from YA62 are adopted. The contribution of this resonance is obtained by numerical integration. The table shows the adopted strengths for the first 24 resonances. In the energy range from 3.0 to 6.05 MeV, the adopted resonance strengths are weighted averages between the values of OR73 and AL75a. Between 6.1 and 6.75 MeV, the values from MU79 are adopted. For the upper and lower bounds of the rates at low temperatures, the limits given by MA78b for the S-factor are adopted. By transfer reaction, CH86a have derived an upper limit for the possible contribution of the subthreshold level at E_x = 7.9 MeV (E_r = −94 keV) which turns out to be negligible. The updated contribution of the 656 keV broad resonance accounts for the differences with the CA88 rates at high ($T_9 > 0.45$) temperatures.

E_r (keV)	J^π	$\omega\gamma$ (eV)					
		YA62	KA65	LO79	others	adopt	
20 ± 1	$5/2^+$				1.5×10^{-19} [SC70] 2×10^{-18} [WI80] 6×10^{-19} [CH86a]	$6^{+17}_{-5} \times 10^{-19}$*	I
89 ± 3				$(1.6 \pm 0.5) \times 10^{-7}$		$(1.6 \pm 0.5) \times 10^{-7}$	M
143.5 ± 1.2	$1/2^+$			0.17 ± 0.02	0.167 ± 0.012 [BE95]	0.167 ± 0.012	I
204.8 ± 1.0	$(5/2^+)$			$(2.3 \pm 0.6) \times 10^{-3}$		$(2.3 \pm 0.6) \times 10^{-3}$	M
315.8 ± 1.2	$5/2^+$			0.057 ± 0.010		0.05 ± 0.01	M
597.7 ± 0.4	$3/2^-$	118 ± 19		420 ± 80	110 [MA78b]	116 ± 18	M
655.8	$1/2^+$	4500		$\approx 1.22 \times 10^5$		$(5.5 \pm 1.0) \times 10^3$*	M
799.0 ± 1.5	$1/2^+$	$(11 \pm 1) \times 10^3$		$(4.1 \pm 1.0) \times 10^4$	11.6×10^3 [CA61]	$(11.2 \pm 0.4) \times 10^3$	M
932.5 ± 0.7	$3/2^-$	147 ± 19				147 ± 19	M
1106.8 ± 0.5	$7/2^+$	18 ± 5				18 ± 5	M
1172.8 ± 1.4	$1/2^+$	351 ± 41				351 ± 41	M
1326.8 ± 1.1	$1/2^+$	213 ± 27				213 ± 27	M
				SE69			
1673.3 ± 1.5	$3/2^+$		1910	1658		1773 ± 115	M
1825.8 ± 1.0	5/2			127		127 ± 23	M
1893 ± 3	$1/2^+$		7470	6968	6809 [CA61]	7150 ± 340	M
2168 ± 3	$1/2^+$			660		660 ± 330	M
2238 ± 3	$1/2^+$		1054	1002		1028 ± 26	M
2260 ± 3	$3/2^+$		11×10^3	11.3×10^3		$(11.15 \pm 0.15) \times 10^3$	M
2314 ± 4	$3/2^+$		4573	4571		4572 ± 300	M
2503.8 ± 1.3	$3/2^+$			988		988 ± 494	M
2620.8 ± 1.6	$5/2^+$			547 ± 273		547 ± 273	M
2769.8 ± 2.5	$1/2^-$			897.5		898 ± 60	M
2867.2 ± 1.9	$5/2^+$			$(12 \pm 6) \times 10^3$		$(12 \pm 6) \times 10^3$	M
2980.8 ± 2.5	$(3/2,5/2)^+$			$(3.3 \pm 1.7) \times 10^3$		$(3.3 \pm 1.7) \times 10^3$	M
Res. 3000 – 6750 keV		see comments					

*see comments

T_9	low	adopt	high	exp	ratio	T_9	low	adopt	high	exp	ratio	T_9	low	adopt	high	exp	ratio
0.007	1.53	8.32	18.3	-25	0.9	0.08	0.90	1.17	1.52	-3	1.1	0.7	4.29	5.09	6.08	4	0.5
0.008	0.65	4.13	73.9	-23	0.9	0.09	7.60	9.63	12.2	-3	1.1	0.8	1.17	1.31	1.47	5	0.4
0.009	1.49	8.85	135	-22	1.0	0.1	4.17	5.19	6.44	-2	1.1	0.9	2.69	2.89	3.12	5	0.4
0.01	0.21	1.05	14.3	-20	1.0	0.11	1.66	2.04	2.49	-1	1.1	1	5.31	5.58	5.86	5	0.3
0.011	2.02	8.34	101	-20	1.0	0.12	5.19	6.30	7.62	-1	1.1	1.25	1.84	1.87	1.91	6	0.3
0.012	1.50	5.00	54.4	-19	1.1	0.13	1.35	1.62	1.95	0	1.1	1.5	4.15	4.20	4.25	6	0.3
0.013	0.90	2.48	23.7	-18	1.1	0.14	3.04	3.62	4.31	0	1.1	1.75	7.29	7.39	7.48	6	0.4
0.014	0.47	1.08	8.83	-17	1.2	0.15	6.09	7.22	8.54	0	1.1	2	1.09	1.11	1.13	7	0.4
0.015	2.04	4.31	29.1	-17	1.2	0.16	1.11	1.31	1.54	1	1.1	2.5	1.86	1.91	1.95	7	0.4
0.016	0.80	1.58	8.73	-16	1.3	0.18	3.00	3.50	4.09	1	1.1	3	2.56	2.65	2.74	7	0.4
0.018	0.92	1.71	6.35	-15	1.3	0.2	6.52	7.57	8.78	1	1.1	3.5	3.14	3.27	3.42	7	0.4
0.02	0.76	1.40	3.83	-14	1.4	0.25	2.52	2.90	3.35	2	1.1	4	3.60	3.79	3.99	7	0.4
0.025	5.45	9.94	20.1	-13	1.4	0.3	6.00	6.91	8.05	2	1.1	5	4.27	4.58	4.92	7	0.5
0.03	1.43	2.61	5.07	-11	1.3	0.35	1.10	1.29	1.54	3	1.1	6	4.73	5.20	5.72	7	0.5
0.04	1.68	3.07	5.98	-9	1.3	0.4	1.78	2.14	2.65	3	1.1	7	5.13	5.79	6.53	7	0.5
0.05	0.56	1.01	1.93	-7	1.3	0.45	2.77	3.45	4.46	3	1.0	8	5.51	6.42	7.43	7	0.6
0.06	1.90	2.91	4.70	-6	1.2	0.5	4.45	5.70	7.56	3	0.9	9	5.92	7.11	8.42	7	0.7
0.07	5.82	7.93	11.0	-5	1.1	0.6	1.36	1.72	2.21	4	0.6	10	6.37	7.85	9.48	7	0.8