

Table 19.20 from (1995TI07): Energy levels of ^{19}F from $^{18}\text{O}(\text{p}, \text{p})^{18}\text{O}$ and $^{18}\text{O}(\text{p}, \alpha)^{15}\text{N}$ ^a

E_p (MeV \pm keV)	Γ_{lab} (keV)	Particles out	Γ_p^b (keV)	Γ_α^b (keV)	J^π	E_x (MeV)
0.095 ± 3^c	≤ 3	α_0				8.084
0.152 ± 1^c	≤ 0.5	α_0				8.138
0.216 ± 1^c	≤ 1	α_0				8.199
0.334 ± 1^c	≤ 1	α_0				8.310
0.6326 ± 0.4^c	2.1 ± 0.1	p_0, α_0	0.065 ± 0.006	2.0 ± 0.2	$\frac{3}{2}^-$	8.5933
$\approx 0.695^c$	≈ 340	p_0, α_0	5^d	95^d	$\frac{1}{2}^+$	8.65
$0.846 \pm 1.5^{c, g}$	47 ± 1	p_0, α_0	26 ± 1.5	21 ± 1	$\frac{1}{2}^+; T = \frac{3}{2}$	8.795
0.9870 ± 0.7	3.8 ± 0.2	p_0, α_0	0.080 ± 0.007	3.7 ± 0.3	$\frac{3}{2}^-$	8.929
(1.135)	140					(9.069)
1.1685 ± 0.5	0.60 ± 0.03	p_0, α_0	0.005 ± 0.0006	0.595 ± 0.08	$\frac{7}{2}^+$	9.1007
1.2390 ± 1	6.1 ± 0.3	$p_0, (\alpha_0)$	0.40 ± 0.03	5.7 ± 0.4	$\frac{1}{2}^+$	9.167
1.4025 ± 1	5.2 ± 0.2	p_0, α_0	0.23 ± 0.02	5.0 ± 0.4	$\frac{1}{2}^+$	9.322
1.620 ± 6	30	p_0, α_0			$(\frac{5}{2})$	9.528
1.668 ± 6	27	p_0, α_0			$\frac{3}{2}^+$	9.574
1.766 ± 3	3.6	p_0, α_0	2.1	1.5	$\frac{3}{2}^+$	9.666
1.928 ± 3	0.16	p_0, α_0	0.09	0.07	$(\frac{5}{2}, \frac{7}{2})^-$	9.820
2.001 ± 4	31	p_0, α_0	12	19	$\frac{1}{2}^+$	9.889
2.2630 ± 0.7	5.0 ± 1.0	$\alpha_0, \alpha_1, \alpha_2$	≈ 5	0.004^c	$\frac{3}{2}^-$	10.137
2.289 ± 3	33	p_0, α_0	2.3	(1.0)	$\frac{1}{2}^+$	10.162
2.363 ± 3	4.5	p_0, α_0	2.8	1.7	$\frac{1}{2}^+$	10.232
2.387 ± 3	24	p_0, α_0	11	13	$\frac{3}{2}^+$	10.254
2.443 ± 4	9.7	p_0, α_0	5.2	4.5	$\frac{3}{2}^+$	10.308
2.644 ± 3	4.6	$p_0, p_1, \alpha_0, \alpha_{1+2}$	2.4	(1.0)	$\frac{3}{2}^+$	10.498
2.705 ± 3	8 ± 2	p_1, α_0			$\frac{3}{2}^{(+)}; (T = \frac{3}{2})$	10.556
2.732 ± 4	23 ± 3	p_1, α_0			$(\frac{5}{2}^+)$	10.581
2.768 ± 3	4.0	$p_0, p_1, \alpha_0, \alpha_{1+2}$	0.7	(1.0)	$\frac{5}{2}^+; T = \frac{3}{2}^a$	10.615
2.925 ± 3	5.7	$p_0, p_1, \alpha_0, \alpha_{1+2}$	4.5	1.2	$\frac{1}{2}^-$	10.764
3.029 ± 4	19.5	$p_0, p_1, \alpha_0, \alpha_{1+2}$	13.0		$\frac{5}{2}^+$	10.862
(3.06)		α_0				(10.89)
3.148 ± 4	(14)	$p_0, p_1, \alpha_0, \alpha_{1+2}$	(4.5)	(4.5)	$(\frac{3}{2}, \frac{5}{2})^+$	10.975
3.266 ± 9	35	$p_0, p_1, \alpha_0, \alpha_{1+2}$			$\frac{1}{2}^+$	11.087
3.386 ± 9	20	$p_0, p_1, \alpha_0, \alpha_{1+2}$			$(\frac{1}{2}^-)$	11.200
3.479 ± 8	23 ± 5	$p_0, p_1, \alpha_0, \alpha_{1+2}$	4.3 ± 1		$\frac{5}{2}^+$	11.288
3.547 ± 25	286 ± 33	p_0	241 ± 2		$\frac{1}{2}^+$	11.35
3.643 ± 9	40 ± 7	$p_0, (\alpha_{1+2})$	17 ± 3		$\frac{1}{2}^-$	11.444
3.694 ± 9	29 ± 6	$p_0, p_1, \alpha_0, (\alpha_{1+2})$	12 ± 2		$\frac{3}{2}^-$	11.492
3.744 ± 8	23 ± 5	p_0, p_1, α_0	3.7 ± 1		$\frac{5}{2}^+$	11.539
3.811 ± 12	66 ± 7	p_0	30 ± 12		$\frac{3}{2}^-$	11.603

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(continued)

E_p (MeV \pm keV)	Γ_{lab} (keV)	Particles out	Γ_p^b (keV)	Γ_α^b (keV)	J^π	E_x (MeV)
3.869 \pm 8	28 \pm 7	p ₀ , p ₁ , (α_{1+2})	12 \pm 2		$\frac{3}{2}^+$; ($T = \frac{3}{2}$)	11.658
4.290 \pm 30	75 \pm 25	p ₀ , α_0 , α_{1+2}	10 \pm 3		$\frac{1}{2}^-$	12.06
4.390 \pm 15	110 \pm 15	p ₀ , p ₁ , (α_0 , α_{1+2})	60 \pm 10		$\frac{3}{2}^-$; $T = \frac{3}{2}$	12.151
4.465 \pm 12 ^c	78 \pm 1	p ₀ , p ₁ , α_0 , α_{1+2}	48 \pm 6		$\frac{3}{2}^+$	12.222
4.782 \pm 7 ^e	16 \pm 4	p ₀ , p ₁	2.4 \pm 1		$\frac{1}{2}^-$	12.522
4.840 \pm 10	50 \pm 10	p ₀ , p ₁ , α_{1+2}	6.4 \pm 2		$\frac{5}{2}^+$	12.577
4.848 \pm 25	300 \pm 15	p ₀	80 \pm 25		$\frac{1}{2}^-$; $T = \frac{3}{2}$	12.58
5.074 \pm 30	100 \pm 40	p ₀ , p ₁ , $\alpha_{(0)}$	13 \pm 5		$\frac{5}{2}^+$; $T = \frac{3}{2}$	12.80
5.135 \pm 30	290 \pm 40	p ₀ , p ₁	114 \pm 17		$\frac{3}{2}^+$; $T = \frac{3}{2}$	12.86
5.225 \pm 25	75 \pm 25	p ₀ , p ₁ , α_{1+2}	3 \pm 1.5		$\frac{5}{2}^+$	12.94
5.27 \pm 50	130 \pm 40	p ₀	20 \pm 8		$\frac{1}{2}^-$	12.98
5.38 \pm 75	300 \pm 75	p ₀	75 \pm 25		$\frac{3}{2}^-$	13.09
5.622 \pm 8 ^e	30 \pm 6	p ₀ , p ₁ , α_0 , α_{1+2}	10 \pm 3		$\frac{7}{2}^-$	13.317
5.670 \pm 25	40 \pm 20	p ₀	2 \pm 2		$\frac{3}{2}^-$	13.36
6.060 \pm 11	55 \pm 10	p ₀ , p ₁ , (α_{1+2})	13 \pm 3		$\frac{7}{2}^-$; $T = \frac{3}{2}$	13.732
6.390 \pm 20 ^f	148 \pm 30	p ₀	12 \pm 3		$\frac{5}{2}^+$	14.04
6.428 \pm 30	88 \pm 30	p ₀	8 \pm 3		$\frac{3}{2}^-$	14.08
6.687 \pm 20	80 \pm 30	p ₀	9 \pm 3		$\frac{3}{2}^-$	14.33
7.080 \pm 20	130 \pm 40	p ₀	21 \pm 5		$\frac{3}{2}^-$	14.70
7.10 \pm 70	270 \pm 70	α_0			$\frac{1}{2}^-$	14.72
7.125 \pm 50	380 \pm 70	p ₀ , α_0	100 \pm 25		$\frac{1}{2}^+$	14.74
7.167 \pm 40	210 \pm 50	p ₀	21 \pm 6		$\frac{5}{2}^+$	14.78
7.337 \pm 40	208 \pm 30	p ₀	20 \pm 4		$\frac{7}{2}^-$	14.94
7.775 \pm 20	70 \pm 10	p ₀	6 \pm 2		$\frac{1}{2}^-$	15.36
7.820 \pm 30	84 \pm 25	p ₀	7 \pm 2		$\frac{5}{2}^+$	15.40
8.282 \pm 40	102 \pm 25	p ₀	8 \pm 3		$\frac{3}{2}^-$	15.83
8.670 \pm 40	180 \pm 30	p ₀	16 \pm 4		$\frac{3}{2}^+$	16.20
8.695 \pm 30	234 \pm 40	p ₀	13 \pm 4		$\frac{7}{2}^-$	16.23
8.747 \pm 30	176 \pm 30	p ₀	13 \pm 4		$\frac{3}{2}^-$	16.28
9.563 \pm 40	348 \pm 70	p ₀	39 \pm 8		$\frac{3}{2}^-$	17.05
9.679 \pm 40	340 \pm 70	p ₀	30 \pm 8		$\frac{7}{2}^-$	17.16
9.986 \pm 30	34 \pm 20	p ₀	3 \pm 2		$\frac{3}{2}^-$	17.45
10.200 \pm 60	100 \pm 60	p ₀	5 \pm 3		$\frac{7}{2}^-$	17.65
10.496 \pm 40	268 \pm 60	p ₀	23 \pm 5		$\frac{3}{2}^-$	17.93
10.596 \pm 60	384 \pm 60	p ₀	32 \pm 7		$\frac{7}{2}^-$	18.03
11.698 \pm 60	584 \pm 150	p ₀	22 \pm 7		$\frac{3}{2}^-$	19.07
12.499 \pm 150	388 \pm 60	p ₀	13 \pm 6		$\frac{5}{2}^-$	19.83

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(continued)

E_p (MeV \pm keV)	Γ_{lab} (keV)	Particles out	Γ_p ^b (keV)	Γ_α ^b (keV)	J^π	E_x (MeV)
12.547 \pm 40	498 \pm 60	p0	39 \pm 8		$\frac{3}{2}^-$	19.87
13.542 \pm 50	434 \pm 60	p0	32 \pm 5		$\frac{1}{2}^-$	20.81
13.662 \pm 50	334 \pm 50	p0	12 \pm 4		$\frac{3}{2}^-$	20.93
13.791 \pm 40	472 \pm 30	p0	25 \pm 5		$\frac{7}{2}^-$	21.05

^a See also Tables 19.14 in (1972AJ02) and 19.17 in (1978AJ03) for the earlier work and references.

^b See also Table 19.18.

^c (p, α) resonance strengths from (1979LO01) are as follows (E_p (MeV \pm keV): Resonance strength (eV)): (0.095 \pm 3: (1.6 \pm 0.5) $\times 10^{-7}$), (0.152 \pm 1: 0.17 \pm 0.02), (0.216 \pm 1: (2.3 \pm 0.6) $\times 10^{-3}$), (0.334 \pm 1: 0.057 \pm 0.010), (0.629 \pm 2: 420 \pm 80), (≈ 0.695 : $\approx 1.22 \times 10^5$), (0.846 \pm 1.5: 4.1 \pm 1.0) $\times 10^4$).

^d Widths not in accord with Γ measured by (1979LO01).

^e See (1982DI11). A resonance at $E_p = 4.58$ MeV in the p channel is also reported. It is suggested that the states corresponding to $E_x = 12.33$, 12.52, and 13.32 MeV have $T = \frac{3}{2}$ and $J^\pi = (\frac{3}{2}^+)$, $\frac{5}{2}^{(+)}$ and $\frac{3}{2}^-$, respectively.

^f The parameters of this resonance and most of the ones below are from a phase-shift analysis by (1979MU05) of the elastic scattering for $E_p = 6.1$ to 16.6 MeV. Other structures have also been observed but parameters for those have not been obtained.

^g See also (1986CO1F).