



RELATIVE ATOMIC MASS

The relative atomic mass (A_r) of atoms is the average mass of all the different isotopes of an element (taking into account the amount of each isotope) on a scale where ^{12}C atoms have a mass of exactly 12.

Imagine you have 90 balls with mass 200 g, and 10 balls with mass 300 g. The average mass of the balls is given by:

$$\text{Average mass of balls} = \frac{\text{total mass of all the balls}}{\text{total number of balls}} = \frac{[(90 \times 200) + (10 \times 300)]}{90 + 10} = \frac{21000}{100} = 210 \text{ g}$$

The relative atomic mass of atoms is worked out in a similar way:

$$\text{Relative atomic mass } (A_r) = \frac{\text{total mass of all atoms}}{\text{total number of atoms}}$$

Element	Isotopes	Abundance	Relative atomic mass (A_r) (to 3sf)
Chlorine	$^{35}_{17}\text{Cl}$	75.8%	$A_r = \frac{[(35 \times 75.8) + (37 \times 24.2)]}{75.8 + 24.2} = \frac{3548.4}{100} = 35.5 \text{ (3sf)}$
	$^{37}_{17}\text{Cl}$	24.2%	
Lithium	^6_3Li	7.6%	$A_r = \frac{[(6 \times 7.6) + (7 \times 92.4)]}{7.6 + 92.4} = \frac{692.4}{100} = 6.92 \text{ (3sf)}$
	^7_3Li	92.4%	
Bromine	$^{79}_{35}\text{Br}$	50.7%	$A_r = \frac{[(79 \times 50.7) + (81 \times 49.3)]}{50.7 + 49.3} = \frac{7998.6}{100} = 80.0 \text{ (3sf)}$
	$^{81}_{35}\text{Br}$	49.3%	
Copper	$^{63}_{29}\text{Cu}$	69.2%	$A_r = \frac{[(63 \times 69.2) + (65 \times 30.8)]}{69.2 + 30.8} = \frac{6361.6}{100} = 63.6 \text{ (3sf)}$
	$^{65}_{29}\text{Cu}$	30.8%	
Fluorine	$^{19}_9\text{F}$	100.0%	$A_r = 19.0 \text{ (3sf)}$
Magnesium	$^{24}_{12}\text{Mg}$	79.0%	$A_r = \frac{[(24 \times 79.0) + (25 \times 10.0) + (26 \times 11.0)]}{79.0 + 10.0 + 11.0} = \frac{2432}{100} = 24.3 \text{ (3sf)}$
	$^{25}_{12}\text{Mg}$	10.0%	
	$^{26}_{12}\text{Mg}$	11.0%	
Iron	$^{54}_{26}\text{Fe}$	5.8%	$A_r = \frac{[(54 \times 5.8) + (56 \times 91.8) + (57 \times 2.1) + (58 \times 0.3)]}{5.8 + 91.8 + 2.1 + 0.3} = \frac{5591.1}{100} = 55.9 \text{ (3sf)}$
	$^{56}_{26}\text{Fe}$	91.8%	
	$^{57}_{26}\text{Fe}$	2.1%	
	$^{58}_{26}\text{Fe}$	0.3%	
Krypton	$^{78}_{36}\text{Kr}$	0.4%	$A_r = \frac{[(78 \times 0.4) + (80 \times 2.3) + (82 \times 11.6) + (83 \times 11.5) + (84 \times 57.0) + (85 \times 17.3)]}{0.4 + 2.3 + 11.6 + 11.5 + 57.0 + 17.3} = \frac{8379.4}{100} = 83.8 \text{ (3sf)}$
	$^{80}_{36}\text{Kr}$	2.3%	
	$^{82}_{36}\text{Kr}$	11.6%	
	$^{83}_{36}\text{Kr}$	11.5%	
	$^{84}_{36}\text{Kr}$	57.0%	
	$^{85}_{36}\text{Kr}$	17.3%	