

A2

Constants & Formulae:

$c = 3.00 \times 10^8 \text{ ms}^{-1}$

$h = 6.626 \times 10^{-34} \text{ Js}$

$N = 6.022 \times 10^{23} \text{ mol}^{-1}$

$k = 1.383 \times 10^{-23} \text{ JK}^{-1}$

$R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1}$

$$\frac{N_{upper}}{N_{lower}} = e^{\frac{-\Delta E}{RT}}$$

$$\frac{N_{upper}}{N_{lower}} = e^{\frac{-\Delta E}{\kappa T}}$$

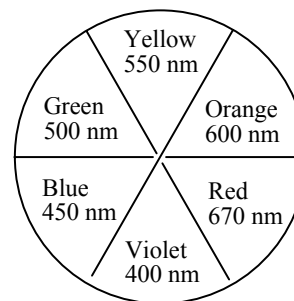
$$E_v = (v + \frac{1}{2})h\nu_o$$

$$E_J = BJ(J + 1)$$

$$\nu_o = \frac{1}{2\pi} \sqrt{\frac{k}{\mu}}$$

$$\mu = \frac{m_1 m_2}{m_1 + m_2}$$

$$I = \mu r^2$$

**Nuclear properties:**

NUCLEUS	¹ H	¹³ C	² D	¹⁰ B	¹¹ B	¹⁹ F	³¹ P	¹⁹⁵ Pt	²⁹ Si
Magnetogyric ratio (γ)	27	7	4	3	9	25	11	6	5
I (spin quantum number)	1/2	1/2	1	3	3/2	1/2	1/2	1/2	1/2
% ABUNDANCE	100	1	0.02	20	80	100	100	34	5

Isotopic masses:

Precise masses of some common elements									
	atomic weight	isotope	mass	% relative abundance		atomic weight	isotope	mass	% relative abundance
H	1.00797	¹ H	1.00783	100	Si	28.086	²⁸ Si	27.9769	100
		² H	2.01410	0.016			²⁹ Si	28.9765	5.10
C	12.01115	¹² C	12.0000	100	P	30.974	³⁰ Si	29.9738	3.35
		¹³ C	13.00336	1.08			³¹ P	30.9738	100
N	14.0067	¹⁴ N	14.0031	100	S	32.064	³² S	31.9721	100
		¹⁵ N	15.0001	0.38			³³ S	32.9715	0.78
O	15.9994	¹⁶ O	15.9949	100	Cl	35.453	³⁴ S	33.9679	4.40
		¹⁷ O	16.9991	0.04			³⁵ Cl	34.9689	100
		¹⁸ O	17.9992	0.20			³⁷ Cl	36.9659	32.5
F	18.9984	¹⁹ F	18.9984	100	Br	79.909	⁷⁹ Br	78.9183	100
							⁸¹ Br	80.9183	98.0
					I	126.904	¹²⁷ I	126.9045	100