TZD II

8.13 THE ENERGY LEVELS IN THE CUBICAL BOX ARE GIVEN BY

$$E = \frac{\hbar^2\pi^2}{2M}\left(\frac{n_x^2}{a^2} + \frac{n_y^2}{b^2} + \frac{n_z^2}{c^2}\right) \qquad (8.103)$$

FOR $a=b=c$, FIND THE LOWEST 8 ENERGY LEVELS AND DRAW AN ENERGY-LEVEL DIAGRAM SHOWING QUANTUM NUMBERS, ENERGIES & DEGENERACIES

FIRST CREATE A TABLE USING

$$E = E_0(n_x^2 + n_y^2 + n_z^2), \quad E_0 = \frac{\hbar^2\pi^2}{2Ma^2}$$

#	n_x	n_y	n_z	E	DEGENERACY
1	1	1	1	$3E_0$	NONE
2	2	1	1	$6E_0$	3-FOLD
	1	2	1		
	1	1	2		
3	2	2	1	$9E_0$	3-FOLD
	2	1	2		
	1	2	2		
4	3	1	1	$11E_0$	3-FOLD
	1	3	1		
	1	1	3		
5	2	2	2	$12E_0$	NONE
6	1	2	3	$14E_0$	6-FOLD
	1	3	2		
	2	3	1		
	2	1	3		
	3	1	2		
	3	2	1		
7	3	2	2	$17E_0$	3-FOLD
	2	3	2		
	2	2	3		
8	4	1	1	$18E_0$	3-FOLD
	1	4	1		
	1	1	4		

→

THE DIAGRAM HAS ENERGIES AT APPROPRIATE LEVELS

LEVEL	E	n_x	n_y	n_z	DEGENERACY
8	$18E_0$ ——	4	1	1	3
7	$17E_0$ ——	3	2	2	3
6	$14E_0$ ——	1	2	3	6
5	$12E_0$ ——	2	2	2	NONE
4	$11E_0$ ——	3	1	1	3
3	$9E_0$ ——	1	2	2	3
2	$6E_0$ ——	1	1	2	3
1	$3E_0$ ——	1	1	1	NONE

E_0