Lecture 18 — Concept Test 1

Two particles are in an infinite square well.

(a) Which of these states below could describe a pair of identical bosons?

1.
$$|E_1 \uparrow E_2 \uparrow\rangle$$

4. $\frac{1}{\sqrt{2}} |E_1 \uparrow E_2 \uparrow\rangle + \frac{1}{\sqrt{2}} |E_2 \uparrow E_1 \uparrow\rangle$
2. $|E_1 \uparrow E_1 \uparrow\rangle$
5. $\frac{1}{\sqrt{2}} |E_1 \uparrow E_2 \uparrow\rangle - \frac{1}{\sqrt{2}} |E_2 \uparrow E_1 \uparrow\rangle$
3. $|E_1 \uparrow E_1 \downarrow\rangle$
6. $\frac{1}{\sqrt{2}} |E_1 \uparrow E_2 \uparrow\rangle - \frac{1}{\sqrt{2}} |E_1 \uparrow E_1 \uparrow\rangle$

(b) Which of these states above could describe a pair of identical fermions?

Lecture 18 — Concept Test 2

6 electrons (with spin s = 1/2) are in a 1-dimensional system with energy levels given by $E_n = n(2 \text{ eV})$. The system is at its lowest total possible energy. What is the energy of the most energetic electron in the system?

Distinguishable (••••)



Lecture 18 — Concept Test 3

How many different ways can you put four identical bosons (••••) into the two states $|\alpha\rangle$ and $|\beta\rangle$?

Hold up a card indicating the number of ways. If your answer is zero, hold up the back of a card.

Hint: make a list.

Indistinguishable (••••)



Lecture 18 — Concept Test 4

How many different ways can you put four identical fermions into the two states $\,|\alpha\rangle$ and $\,|\beta\rangle?$

1.	1	3.	3	5.	16
2.	2	4.	5	6.	0