

For these questions, use the simulation “Energy eigenfunctions of the two-dimensional infinite well” in the QuVis HTML5 collection.

www.st-andrews.ac.uk/physics/quvis/simulations_html5/sims/infwell2d/infwell2d.html

1) Have a play with the simulation for a few minutes, getting to understand the controls and displays. Note down three things about the displayed quantities that you have found out.

2) a) How are the number of maxima along x and y in the probability density graph related to the quantum numbers n_x and n_y for the square well and for the rectangular well?

b) How do you determine the total energy of the particle given the energies E_x and E_y ?

3) a) For the infinite *square* well, can you find different combinations of the quantum numbers n_x and n_y that give the same total energy (so-called degenerate states)? If so, give a few examples. Then generalize your findings.

b) Do there exist degenerate states for the rectangular well shown?

4) Compare the amplitude of the probability density for the square well and the rectangular well. Determine by what factor they differ, explaining your reasoning.

5) Which of the Challenges did you find most difficult and why? Explain how you solved the challenge. If none of the Challenges were difficult, choose the one you found most interesting and explain how you solved it.