

**Quantum Mechanics II: PHYS 314 (Spring 2021)**  
**Quick quiz 10**

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**Instructions**

These quick quizzes are low-stakes assessment tools to help cement your understanding of our material. They will help you remember the key facts and can serve as a study guide to help you focus on material you are less familiar with. These quizzes do not contribute to your grade and are for your own use.

1. **Without looking at your notes or the textbook, and without consulting with your neighbour**, write your answer to each question in the **first column**.
2. Discuss with your neighbour and use your notes or the textbook as needed to answer each question and write your answers to each question in the **second column**. You should complete the second column, but do not add anything to your first column.

There are five questions.

**Question 1**

Write down the equation for the first-order correction to the energy levels in a nondegenerate quantum mechanical system.

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**Question 2**

What are the “good states” in degenerate perturbation theory and how do you calculate them?

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**Question 3**

Write down the expression for the Bohr energy levels of the hydrogen atom.

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**Question 4**

How many states of the hydrogen atom have principal quantum number  $n = 2$ ? What are the quantum numbers associated with each of these states?

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**Question 5**

When would you choose to apply the variational method and when would you choose to apply perturbation theory? What are the advantages and disadvantages of each?

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