



## Inquiry Approaches

### Initial Inquiry

What are some factors that influence the speed of reaction?

The concentration of the reactants, pressure, presence of a catalyst, order of reaction and temperature all play a role in the speed of reaction.

What are some uses of nanoparticles?

Titanium dioxide, an active ingredient in sunscreen, is a nanoparticle. Quantum dots are also used in biomedical imaging for tagging cellular components and for tracking molecules in real-time. Quantum computing hopes to use quantum dots, a type of nanoparticle, as qubits. Carbon nanotubes are another use of nanoparticles and produce carbon molecules with novel properties, with many potential applications.

### Experimental Procedure Inquiry

Why is the UV light necessary?

The UV light excites the electrons in the material from the ground state to the excited state. The resulting light we see is the photon being released as the electron returns to the ground state.

Why is sulfuric acid used to clean the glassware?

The sulfuric acid will neutralize any of the bases and will react with the zinc oxide nanoparticles to form larger particles of zinc sulfate.

### In-Depth Inquiry

The colour of the heated test tube and cooled test tube should differ. Why?

The temperature changed the reaction rate which in turn affected the size of the resulting quantum dots. The size of the dots relates to their colour.

In the activity, what were the quantum dots made of?

The quantum dots are zinc oxide (ZnO) particles.

Why do some molecules self-assemble?

Molecules self-assemble into a more ordered state because it will reduce the amount of free energy and systems prefer low energy states.