



# CALIFORNIA STATE SCIENCE FAIR 2007 PROJECT SUMMARY

<b>Name(s)</b> <b>Stephanie T. Chau</b>	<b>Project Number</b> <b>S0805</b>
<b>Project Title</b> <b>The Effect of the Magnetic Field and Diamagnetic Materials on Diamagnetic Levitation</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> The purpose of this project is to find out whether the change in magnetic fields and diamagnetic materials affects to diamagnetic levitation.</p> <p><b>Methods/Materials</b> Materials: A threaded stainless steel rod, a nail on glides, two wooden support dowels, a wooden adjustable arm, a wooden base, a white delrin rod/bar, floating magnets (NdFeB cubes/ NdFeB discs/ Ceramic disc), lifting magnets (NdFeB/Ceramic discs), and diamagnetic materials (Bismuth discs/ Carbon Graphite blocks). Methods: The first major step was building a levitation fixture. The second major step was observing and measuring the distance of the lifting magnet and the floating magnet to the base of the fixture when the floating magnet was in stable levitation during those experimental set ups with the use of Bismuth discs, Carbon Graphite blocks and a Carbon Graphite block. Several different test conditions also were applied in this experiment to see the variation of levitation. These conditions were different types of powerful lifting magnets and floating magnets, different gaps between two diamagnetic materials, two kind of diamagnetic materials, table stand (wood and steel), and temperature (room and hot). Each test condition was tested three times except for the experiment with the use of only a Carbon Graphite block had only one trial.</p> <p><b>Results</b> The results from this experiment were that the stronger the lifting magnet, the farther it could be from the floating magnet while still lifting it; the more powerful floating magnet or the better diamagnetic material was used, the easier stable levitation could be achieved. In addition, the temperature, the steel stand, the use of two diamagnetic materials and their gaps and different kind of materials underneath the lifting magnet also had a big effect on the stable condition of the levitation. However, the most important finding was that the levitator was very sensitive to any disturbance and required a very critical adjustment to make the floating magnet hovered stably.</p> <p><b>Conclusions/Discussion</b> In conclusion, the results of this experiment demonstrated that the stable condition of the levitator really depended on the strength of magnetic field, the kind of the diamagnetic materials, and the floating magnets were used. These results also supported the hypothesis that diamagnetic levitation occurs only when the force on such an object is strong enough to balance the weight of the object itself.</p>	
<b>Summary Statement</b> Placing a magnetic material in diamagnetic field with a biasing magnet is one of many ways to achieve diamagnetic levitation and its stable condition depends on the change in the magnetic field and diamagnetic materials.	
<b>Help Received</b> I would like to thank the members of my family who assisted me with this project: my mom who proofread, and my father who assisted in the construction of the levitation fixture and the display board. A special note of thanks to my science teacher for his expert guidance.	