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| **Objective** |
| http://img4.wikia.nocookie.net/__cb20140801081517/plantsvszombies/images/d/dd/Pvzas_gw_catapult.png  You and your group will plan, build, test, and assess a small-scale siege engine, following either a traditional catapult or trebuchet design. Your group will primarily be graded based on the typed report you will submit which details the various design decisions you make and the analyses you perform throughout this process. No grading weight will be given to how well your design performs relative to other groups, but we will have one day at the end of the project in which each group presents and tests their design. |

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| **Design Criteria** |
| Your catapult/trebuchet must:   1. Be your group’s original design (no kits may be used, but you can look online for ideas and inspiration) 2. Stand freely on its own 3. At minimum fire a tennis ball 4. Fire without falling over 5. Fit within a square meter (although the firing arm may extend past this range) 6. Be completely mechanical in design (use of electricity, hydraulics, combustion, compressed air, etc. is prohibited) 7. Be made out of non-hazardous materials |

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| **Report Components** |
| Your report will consist of two components, listed below. A selection of questions to be answered is provided as a guideline for the progression of the report. How your group decides to answer each question is up to you, but the expectation is that all of these questions are fully answered in an ordered and coherent way, utilizing a physics perspective to justify your reasoning. |
| * Pre-Assessment Data and Analysis |
| * + Why did we choose the design we did?   + Are we choosing to focus on designing our device to achieve maximum range or maximum precision? A mixture of the two? Why?   + What design decisions are we making to accomplish these purposes? Why? |
| * + What determines how far the tennis ball will go?   + What values do we need to experimentally determine in order to numerically predict this distance?   + What experiments did we set up in order to determine this?   + What data did we receive from these experiments?   + How comfortable are we with making predictions based on this data? Why? |
| * Post-Assessment Data and Analysis |
| * + How are our results different than our predictions?   + What caused these differences?   + What changes can we make in order to improve the effectiveness of our design in achieving its decided purpose? |

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| **Timeline** | |
| **(Beginning of unit – insert appropriate dates in this column)** | * Project description given |
| First day of project week | * Catapult/trebuchet is designed, built, and brought to class |
| First day of project week | * Analysis of design begins |
| Third day of project week | * Design analysis ends |
| Fourth day | * Design test day – each group shows off their catapult/trebuchet |
| Fifth day | * Design testing continues independently |
| Beginning of next unit | * Report turned in |

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| **Grading Rubric** | | | |
|  | **Below expectations** | **Meeting expectations** | **Points  (0-10)** |
| Design Criteria | * Design does not meet the following design criteria: | * Design meets all design criteria |  |
| Pre-Assessment Data/Analysis |  | * Thoughtfully and thoroughly answers each question posed in the project description * Specific physics-based reasons cited when justifying decisions and analysis * Effectively utilizes multiple forms of media when necessary to help audience understand group’s reasoning |  |
| Post-Assessment Data/Analysis |  | * Thoughtfully and thoroughly answers each question posed in the project description * Specific physics-based reasons cited when justifying decisions and analysis * Effectively utilizes multiple forms of media when necessary to help audience understand group’s reasoning |  |
| Group Participation (based on group feedback form) |  |  |  |