## **Pre-AP Physics Project – Catapults**

**Objective:** To design and build a catapult that will launch tennis balls a distance of 4 meters to hit a target on the floor.

## **Requirements:**

- 1. The catapult may be constructed from any type of materials.
- 2. The catapult must have a moveable arm which will hurl the tennis ball projectile.
- 3. The moveable arm may only be powered by some elastic means. Springs, bungee cords, rubber bands, tightened rope, etc. **No other form of power may be used**.
- 4. The catapult must sit freely on the floor and be able to launch a tennis ball onto a target 4 meters away from the front edge of the catapult.
- 5. The catapult must be equipped with a device that will lock the catapult arm in place prior to launch. The release of the arm must be done by a mechanical device (ie: trigger). You may not hold the arm in place at launch.
- 6. After launch the tennis ball must **pass over a 0.60 meter barrier** placed halfway between the trebuchet and the target.
- 7. The target is set at the same base level as the base of the launcher.
- 8. The dimensions of the base of the catapult must not exceed 2ft. by 2ft.
- 9. The height of the catapult may not exceed 2 ft. when the catapult is in set (locked and loaded) position.
- 10. The overall project must not exceed 2 ft. x 2ft. x 2 ft. when in the set position.
- 11. All group members are expected to participate in all phases of this project.

This is a group project in which each member will receive a grade. Groups will be made up of **up to 4** members. Each group will construct and build a catapult that conforms to the above requirements.

Each group will create a **coat of arms** to be displayed with their catapult. The coat of arms must fit within the boundaries of an **8.5" x 11" piece of paper** and should be in full color.

## **Project Grades:**

**Accuracy Grade:** Each group will have three attempts to hit the floor target. Point values will be awarded as follows:

- 3 successful hits  $\rightarrow$  110
- 2 successful hits  $\rightarrow$  100
- 1 successful hit  $\rightarrow$  90
- 0 successful hits  $\rightarrow$  0

**Coat of Arms Grade:** Each group will receive a grade based on the quality of their coat of arms. The coat of arms will be judged on the quality of art work, as well as on an explanation of the meanings of all symbols, sayings and colors appearing on the coat of arms. This explanation must be submitted in a typed format. Judging will be conducted by a panel of teachers with each coat of arms being rated on a scale of 1-10 (1 being low, 10 being high) on the following criteria.

Visual Appeal - appropriate use of symbols and colors, appealing to the eye

Quality of Explanation - appropriate explanation of each symbol and each color used

Appropriateness of Design – design conforms to appropriateness for a school project

The total points awarded will then be divided by the total points available (30) to determine the final numeric grade.

**Participation Grade:** Each student will receive a grade based on the evaluations of their peers in the group. Group members will grade each other on a scale of 1-10 (1 being lowest and 10 being highest) upon the following criteria:

- 1 Ability to work with others
- 2 Participation in building activities
- 3 Participation in design process
- 4- Participation in coat of arms design
- 5 Overall cooperation with others in group

The total points awarded will then be divided by the total points available (50) and the evaluations of all group members will be averaged to determine the final numeric grade.

**Competition Grade:** After completing the accuracy portion the groups will be then placed in competition against each. The object of the competition will be to knock down three plastic bowling pins placed at the same distance as the target and spaced equidistant apart before the other group knocks their bowling pins down. It will be a double elimination tournament and grades will be determined by finish in the competition.

1<sup>st</sup> Place → 100 2<sup>nd</sup> Place → 95 3<sup>rd</sup> Place → 90

.....and so on.