

## Physics 200 Midterm Project: Fire from Friction\*

Goal: Start a wood fire using friction\*

Overview: There are many existing methods of creating fire using friction generated by mechanical (not chemical, electrical, nuclear, etc.) means. Use an existing method or engineer your own human-powered method/contraption to produce a flame, a glowing ember, or, at least, some smoke.

Awards: Note that this is an optional project. There is no penalty for not participating.

- Production of clearly visible smoke = +2% added to the Unit 3 test.
- Production of a visibly glowing ember (a.k.a “coal”) = +6% added to the Unit 3 test.
- Production of a visible flame = +7% on the Unit 3 test, glory, and great personal satisfaction.

Requirements/restrictions:

- Fire must be created by human-powered, mechanical means. During the fire starting procedure, no non-mechanical energy (e.g. electrical or solar energy) may be used to raise the temperature of the fuel to its ignition point.
- The fire making apparatus must be made "from scratch" by the participant(s). To clarify, you may use pre-made items such as rope, pulleys, screws, glue, or gears, but pre-made *assemblages* of pulleys and/or gears (e.g. a hand drill) are forbidden. You may also use the provided bearing block, below.
- Combusted materials are limited to natural or "day-to-day" items that are not generally understood to be highly flammable or volatile (i.e. no gasoline, etc.)
- Naturally occurring resins, such as those found in some wood and bark, are permitted. However, in order to be used in this competition, these items must be harvested from a natural setting by the participants.
- “Group” Size: You may work on this individually or in pairs. Students working in pairs must provide a brief written description of each partner’s significant contribution to the project.

Provided Materials: While there are many different methods of starting a fire using friction, the bow drill method seems to be the most popular. If you use this method, you may have trouble making a bearing block, so I will provide some maple bearing blocks that you may use. I have sanded them and pre-drilled a 3/4” hole to receive a spindle. I also have some cord that you can take home. It is probably not ideal, but I think it can work. Remember, you do not have to use a bow drill.

- Cord (about 1m)
- Hardwood bearing block
- Firewood (to be used *after* you start a fire, so that we can roast marshmallows)

Tips:

- Making a full-fledged fire using friction isn’t easy. Success requires some scientific understanding and some physical fitness. It also requires quite a bit of trial and error to master a successful technique.
- To make a fire you need both an apparatus (e.g. bow drill) to create an ember, and you also need a “nest” of some high quality tinder that you can ignite using the ember.
- The type of wood you use (for all parts of this process) is important. Some woods work much more easily than others.
- Dry wood burns best. You can dry wood out in an oven.
- There are A LOT of ideas for *primitive fire making* on the internet.

\* There are ways (e.g. a *fire piston*) to start a fire by non-friction mechanical means.