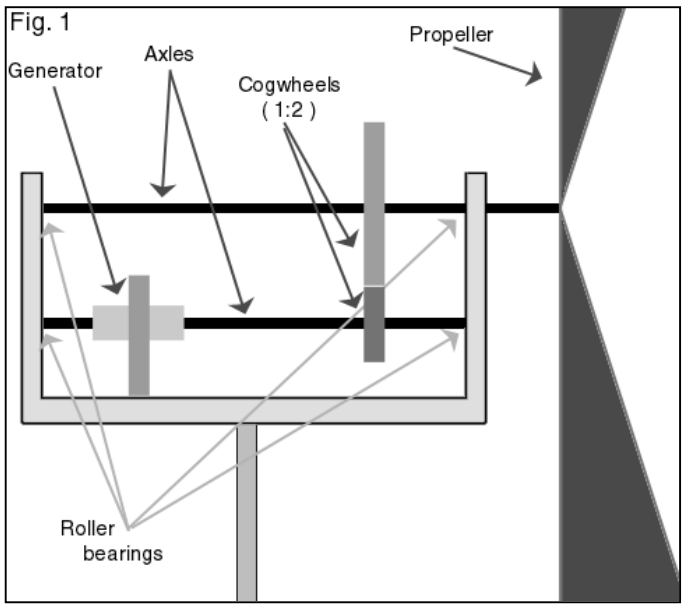
Group 4 project, ENERGY

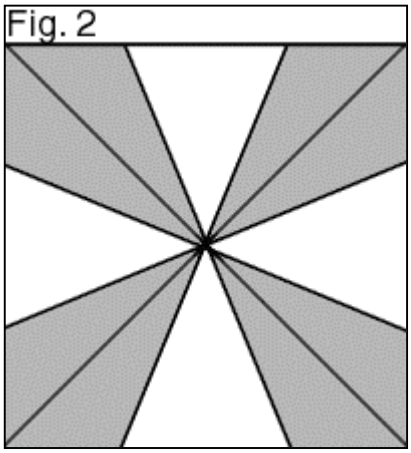
Lab-report in Physics and Chemistry
Preformed spring -98

The general issue was 'Energy'. Three fellow students and me decided to build a wind generator in physics. Then, to make connection to chemistry, we decided to build a lead battery and charge the battery with the power from the wind generator. Here is a report of how we built the wind generator and the results and effects.



The first thing we did was to draw some suggestions of the construction of the windmill. We decided upon one and went to the porter and asked for some kind of sheetmetal to use as a propeller. After some suggestions from him, he ordered one square meter aluminum sheet. During the time it took for the delivery we started to construct the main structure (see figure 1 for main structure). The 'frame' was made up of wood, so that is should be simple to drill and attach the roller bearings. The axles were made of steel. The generator was a very simple construction, parts were taken from the physics institution on the school, and what was used was one U-magnet, and one coil, and some kind of connector, consisting of two copper-attaches that were pressed against the poles of the coil. Put together they functioned as a very simple generator. And finally the cogwheels were taken from a Chrysler's camshaft-gear with a ratio 1:2.

It took some time to put the stuff together, but after some hours and some help from the porter we managed to put the right thing in the right place. The next thing to do was to make a propeller.



We got the aluminum-sheet from the porter and started to draw the shape of a propeller. To make it easy for us to cut, we simply draw six straight lines through the center of the metal sheet (fig. 2). We then cut out the marked parts, and then twisted the blades approximately 30°.

We put all the parts together and went out to measure. Here is the data:

Wind speed (m/s)	Effect (V)
0.5	0.003
0.7	0.005
0.9	0.008
1.2	0.01

As we understood, and as you can see, the effect of this windmill is minimal, almost not measurable. This was also a problem, since this is the average power during 30 seconds, this is only an approximation. The tools we used for measuring were a digital multi meter (fig. 3) and an analog wind velocity indicator (fig. 4).

Sources of error and things we could have done better…

Fig. 3


Fig. 4

So, as we have noticed, the practical result was not as good as we planed. Of course we hadn't hoped for a future source of power, we were just interested in the technique and main ideas of wind-power and problems that goes along with the technique. But this is what we understood we could do better, if only we would have more time and interest in making progress. First the propeller – we could have spent more time making it more stable. The only thing that kept it in place was that the edge was bent, and a small furrow in the middle of the blade. Then we should have thought of bending the blade with different angle depending on the distance to the root, so called blade twist. Since the airspeed is higher at the tip of the blade it should have a smaller angel with the plane of rotation. We could also have done the propeller with a higher mass, since we want a steady current out, to the battery.

Second and probably the main reason to the bad result: the ratio of the cogwheels. A ratio of 2 to 1 is too much too small. The side effect of a greater ratio is that the propeller might not get enough power to make the smaller cog to rotate, but when we did the experiment, we noticed that the propeller could easily pull more, maybe up to a ratio 20 to 1. This would give the second axle a higher rotational velocity and the effect would be much higher.

Third, the whole construction was very unstable and caused the windmill to vibrate. This will give more friction and cause the axles to slow down. We should also have given the roller bearings some oil so there would be less friction.

Participant:	Candidate number: