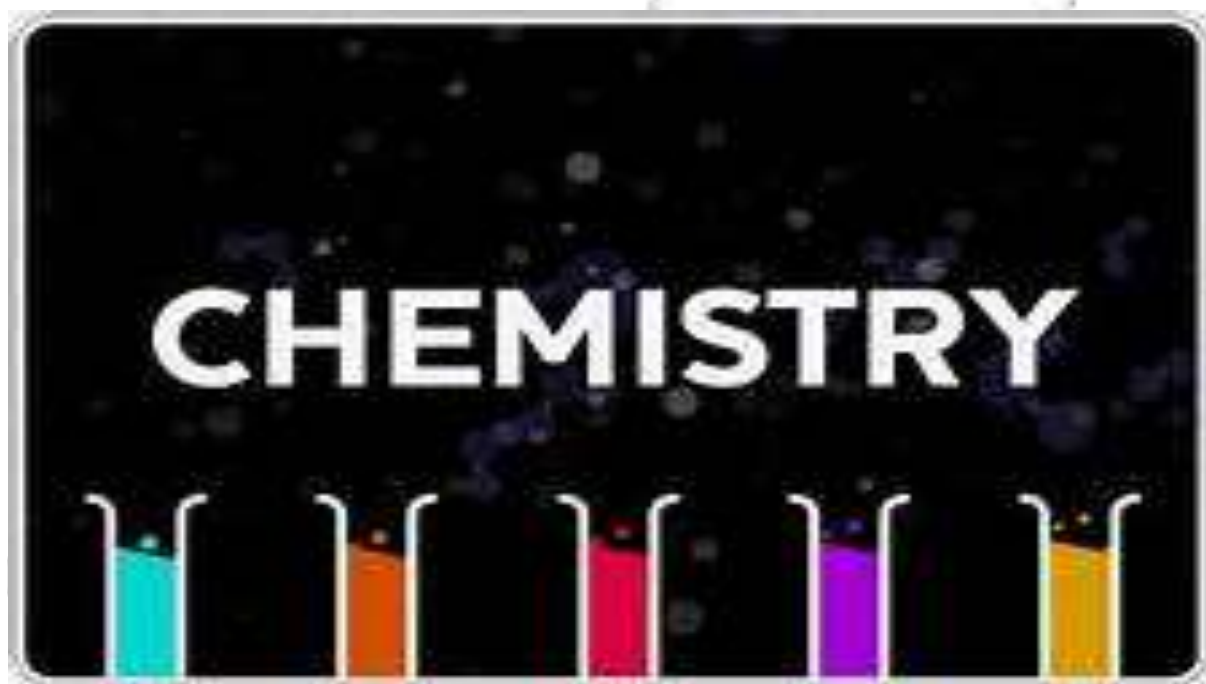


*CHEMISTRY*  
*INVESTIGATORY*  
*PROJECT*



*NAME: VIGHNESH J.M*

*CLASS: XII-F*

*ROLL NO: 12638*

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**DEPARTMENT OF CHEMISTRY**

This is to certify that VIGHNESH.J.M of class XII-F has successfully completed the research on the below mentioned project under the guidance of Mr. Purushothaman . (Subject Teacher) during the year 2015-16 in partial fulfilment of chemistry practical.

Signature of external examiner

Signature of chemistry teacher

# ACKNOWLEDGEMENT

In the accomplishment of this project successfully, many people have best owned upon me their blessings and the heart pledged support, this time I am utilizing to thank all the people who have been concerned with project.

Primarily I would thank god for being able to complete this project with success. Then I would like to thank my principal Mrs. M A Suhara and Chemistry teacher of Mr. Purushothaman , whose valuable guidance has been the ones that helped me patch this project and make it full proof success his suggestions and his instructions has served as the major contributor towards the completion of the project.

Then I would like to thank my parents and friends who have helped me with their valuable suggestions and guidance has been helpful in various phases of the completion of the project.

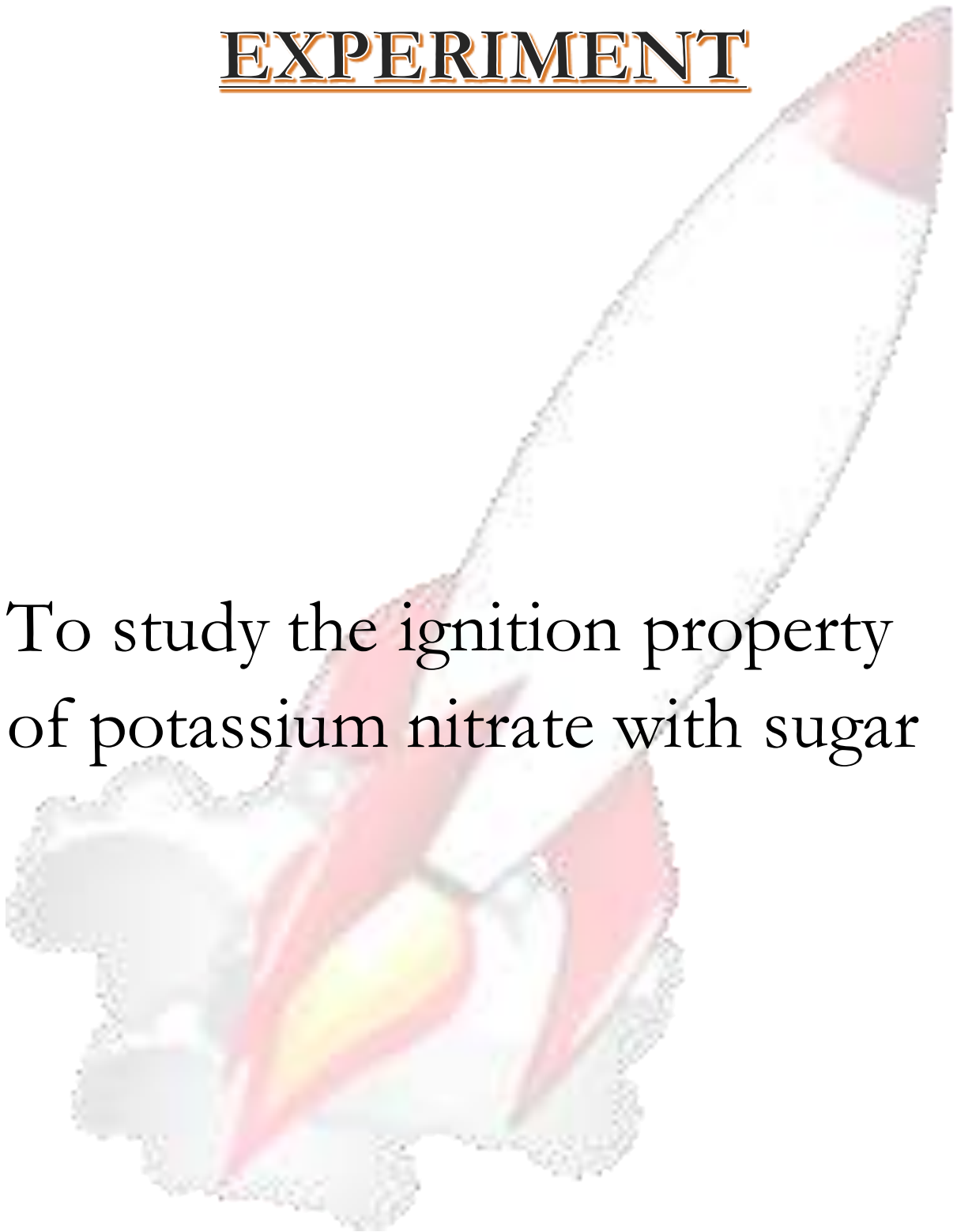
Last but not the least I would like to thank my classmates who have helped me a lot.

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# AIM OF THE EXPERIMENT

To study the ignition property  
of potassium nitrate with sugar



# APPARATUS REQUIRED

1. *BEAKER*
2. *GLASS RODS*
3. *BURNER*
4. *CHINA DISH*
5. *KNO<sub>3</sub>*
6. *SUGAR*
7. *PVC PIPE*
8. *PVC CAP*



# INTRODUCTION

We built and tested rocket engines using Potassium Nitrate & Sugar. We aim that Potassium Nitrate & Sugar can be used as rocket propellant engine for effective performance. The engines were made completely from PVC casings. The experiments were carried out via tests in which the rocket engine was mounted nozzle-end-down in a test stand, so that when the engine was ignited it pressed up against gravitational pull to produce a thrust force to lift it up.

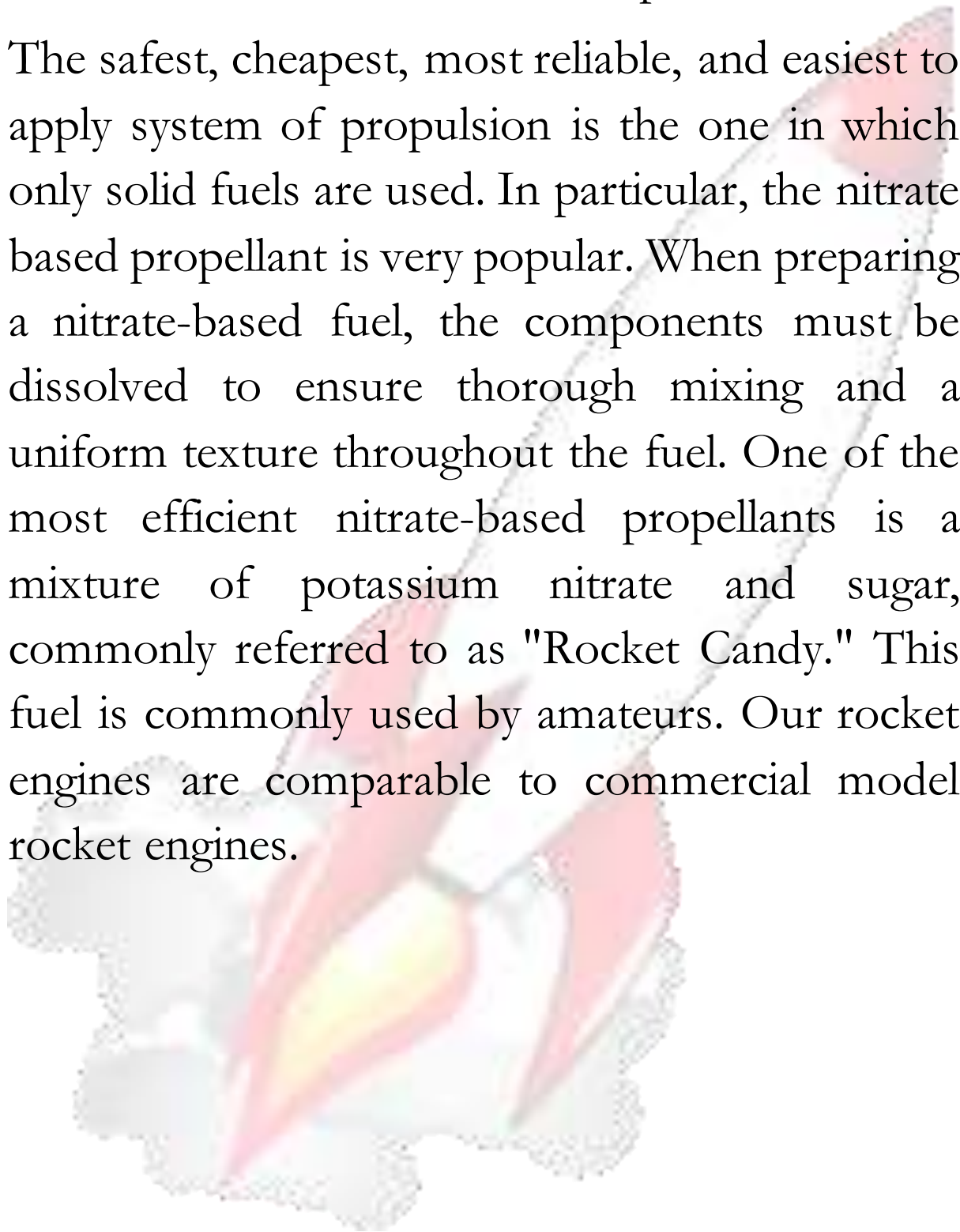
The following is the chemical equation for the combustion of Potassium Nitrate and sugar.



Potassium nitrate has a low health rating and is not flammable at all. It has a rating of three in instability but that is to be expected since we want it to be explosive to be able to propel our

engines. It will be contained in small quantities to minimize the effects of a rare explosion

The safest, cheapest, most reliable, and easiest to apply system of propulsion is the one in which only solid fuels are used. In particular, the nitrate based propellant is very popular. When preparing a nitrate-based fuel, the components must be dissolved to ensure thorough mixing and a uniform texture throughout the fuel. One of the most efficient nitrate-based propellants is a mixture of potassium nitrate and sugar, commonly referred to as "Rocket Candy." This fuel is commonly used by amateurs. Our rocket engines are comparable to commercial model rocket engines.





# PROCEDURE

- Method: Preparing the rocket:

The engine casing was made from a 8-1/4" long 1" Schedule 40 PVC pipe. One end was covered with an end cap, with the nozzle fixture inside of it. The length and width of the PVC pipe were chosen specifically because the diameter of 1" is small enough to be safe, but still large enough to work with. If we were to halve the amount of propellant used by the engine, we would have two options. The first would be to decrease the diameter of the PVC pipe so as to maintain the length of the grain. This would make building the engine extremely hard, not only because of the fact that everything is so much smaller, but because of parts availability issues, such as finding the correct size washers. Another option would be to keep the same width, but use a much shorter PVC pipe. This would dramatically decrease burn time and thrust, meaning that any errors in any of the measuring equipment will be

amplified greatly. Approximately 125 grams of propellant will be used inside of one engine.

• Directions for making the propellant:

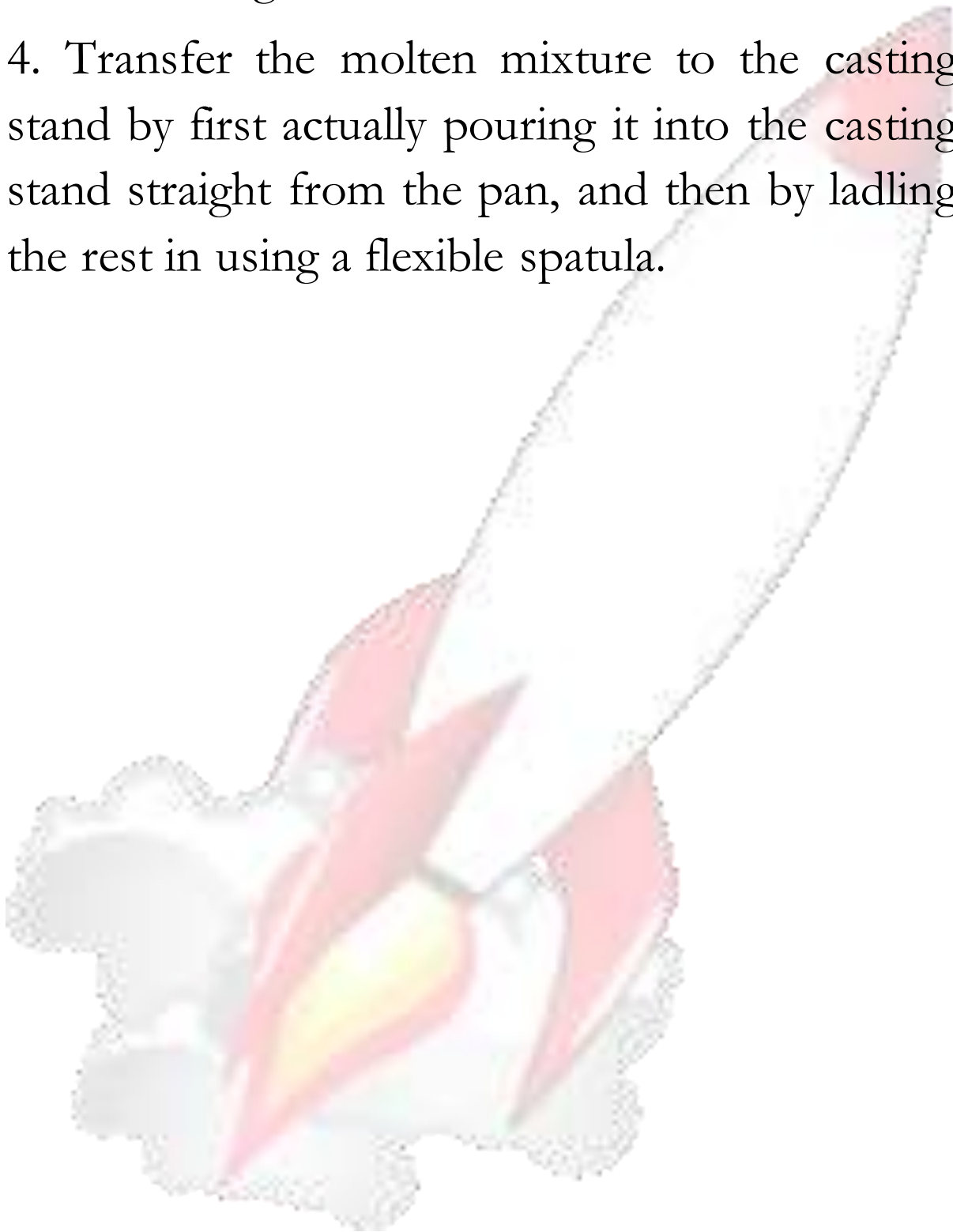
1. Ensure that the sugar and  $\text{KNO}_3$  are grounded to fine powders. Put them into a container and shake them.

2. Use a double pan arrangement to melt the  $\text{KNO}_3$  and sugar, with canning wax used in the bottom pan as the heat transfer medium. The reason for this is that wax does not change temperature too easily, thus eliminating a quick spike in temperature which could ignite the propellant. Throughout the melting process, the wax will remain steady at  $250^\circ\text{F}$ . The mixture is stirred with a wooden dowel until it is completely molten and has a homogeneous consistency.

3. The molten mixture will be transferred to a casting stand made from PVC identical to that of the actual engine casing and lined with paper. Within this stand, the propellant will cool and

form a solid block that we can then transfer into the actual engine.

4. Transfer the molten mixture to the casting stand by first actually pouring it into the casting stand straight from the pan, and then by ladling the rest in using a flexible spatula.



## • OBSERVATION

- The rocket goes up with high speed for short distance
- High flame & smoke produced.

IMAGES:





# CONCLUSION

POTASSIUM NITRATE is an oxidizing agent.

Sugar can be used as a fuel base with nitrates.

