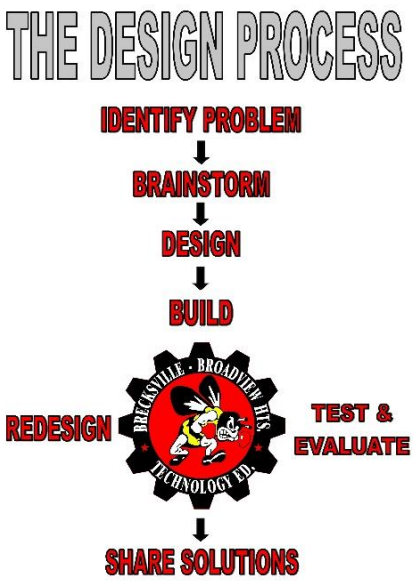
NAME: _____

PERIOD: _____

Ever ridden on a train before? What about an airplane? What if somone could combine the two, making a flying train? It turns out someone already has, and even better, this “flying” train doesn’t need engines, it is environmentally friendly, and would require less maintenance than your car. Also let me mention it is way quieter than a normal train. This relatively new transportation technology is called Maglev. Maglev stands for Magnetic Levitation. A Maglev train uses magnetism to hover above the ground, which allows this train to travel at speeds unseen before by trains.



IDENTIFY PROBLEM (Problem Statement)

In this unit we are studying the relativly new form of transportation technology called Maglev. Your job is to use the design process to help you learn about, design, and build your very own Maglev train/car to compete in a class competition. The competetion will take place on the 25' Maglev guideway in class. The winner of the competition is the student who creates the train/car that can travel the length of the guideway in the least amount of time using only materials provided. Students will be given time to test and evalute their designs, then redesign and change them as nessesary.

BRAINSTORMING

First, research and consider all possible ideas and configureations of the Maglev train design. Then the next step is to create sketches of 4 different designs. Fold your paper into 4 equal sections and draw on good size sketch in each section. At least 1 of the 4 sketches needs to be an isometric representation of the idea. The other 3 sketches can be any view of your choice (top, front, side).

After the 4 sketches are complete you are to create 3 different template designs for the bottom surface of the Maglev train using graph paper provided. These need to be drawn full scale so the design that is chosen to be constructed can be cut out and taped to the acrylic. This will act as a template and make it much easier to exactly create your design.

Considerations:

- Weight distribution
- Balance
- Overall weight
- Aerodynamics
- Friction
- Push or Pull

BUILD

The building process first starts by taking inventory of the provided building materials.

Everyone should receive:

- 1 piece of acrylic 6” x 2.5” x ¼” (base)
- 2-3 smaller assorted pieces of acrylic (motor mount)
- 1 high speed motor
- 1 high speed propellor
- 4 1” x 3/4” x 1/8” magnets
- 4 wires or one 24” wire

Other materials that may be used later:

- Masksing tape
- Electrical tape
- Solder
- Metal ¾” Washers (balance)
- Super glue

Once all materials are accounted for the first step is to tape the base template created ealier to the corrisponding piece of acrylic to help cut out the base on the band saw. The next steps are up to the engineer. The motor mounts need to be created and attached to the base. Also now is a good time to attach the magnets. Magnets can be placed on either side of the acrylic base although **pay close attention** to the orientation of the magnets before they are glued on. A hint would be to tape magnets on and test the car on the track before gluing as super glue is meant to be permanent.

Once the motor is attached to the motor mount the wires can be run. There are two terminals on the motor and they are universal. Each terminal should have two wires soldered to it. Both wires that come from the terminal need to go to the same side of the car (one in the front of the car and the other in the rear) the wires need to extend over the edge of the car to make contact with the rails of the track.

TEST & EVALUATE

After the maglev train is fully constructed it is time to test it. Take it to the track and with permisson from the teacher perform a few test runs down the track. Make sure to make observations on how your car is performing.

Things to look for:

- **Balance**
- **Wire connection with rails**
- **Friction with rails**
- **Pitching or diving**

REDESIGN

Use information observed durring testing & evaluation to change the design for the better. The first thing that you change may not fix the problem, it may even make the problem worse. A helpful hint is to only change one variable at a time so that it is clear if and which adjustments you are making are working or not.

SHARE SOLUTIONS

This is thought of as the “final” step in the design process. Now the design is finalized and it is time find out how well you have done. For this project this is where we have our class competition (drag race).

Competition rules/info:

- **Each students has 3 attempts**
- **You have 30 secconds to place your car on the track after your name is called**
- **A false start and an incomplete pass count as an attempt**
- **All 3 scores are recorded and the lowest time is the one that counts**
- **Lowest time in the class is the winner!**

DESIGN

For the first project the design portion of the project is moved to the end. In this step a multiview drawing (using AutoCAD) of the Maglev train is produced. This is a formal and professional method of communicating the design to peers and making the design repticalble (capible of being produced by anyone).

The multiview drawinging must:

- Full scale
- Include all parts except wires
- Include proper views (top, front, side)
- Use construction lines to project geometry
- Fully dimensioned (anyone should be able to build your exact car)
- 1 inch spacing between views

GRADING

For this project the grade will be detrminded by both formative and sumative assessments. The larger (summative assessment) part will be comprised of everything done within the design process to design, build, test & evaluate, and redsign the project. The smaller (formative assessment) part is determined by the performance of the Maglev train constructed compered to the performance of the others in the class.

SUMMATIVE

Category	50% - 69%	70% - 84%	85% - 100%
Sketches (10)	5-6.9	7-8.4	8.5-10
Brainstroming sketches	2 complete sketches.	3 complete sketches. 1 ISO.	All four sketches complete. 1 ISO with labels.
Base Template (10)	5-6.9	7-8.4	8.5-10
Templete for base on grpah paper	1 idea fulley created	2 ideas fully created	3 ideas fully created correct scale and layout.
Multiview CAD (30)	15-20	21-25	26-30
Top, front, side of Maglev design in AutoCAD	One side represented, missing dimensions or drawings misplaced.	Only two sides represented, missing dimensions or drawings misplaced.	All 3 sides represented (top, front, side). Fully dimensioned and gemometry projected.

Maglev Train/Car (50)	25-34.5	35-42	42.5-50
Project constructed	The project created follows all requirements, only uses correct materials, student follows the design process, and produces a poorly thought out and uncreative design. Little effort displayed.	The project created follows all requirements, only uses correct materials, student follows the design process, and produces a working moderately thought out and creative design. Moderate effort displayed.	The project created follows all requirements, only uses correct materials, student follows the design process, and produces a working well thought out and creative design. A lot of effort displayed.
Project Summary (20)	10-13	14-16	17-20
Evauluate your work in the Maglev process	Few questions complete with well thought out responses.	All answers completed with not well thought out or incomplete responses.	All questions answered fully with well thought out responses.

FORMATIVE

Category	Bottom 3rd	Middle 3rd	Top 3rd
Performance (10)	7-7.9	8-8.9	9-10
How well did the train/car work?			