Name:

Date:

Class:

PAPER HELICOPTER LAB

Pre-Lab Questions:

1. **What causes something to fall to the ground? _____**
2. **Who is Sir Isaac Newton? _____**
3. **What causes something to slow down as it is falling? _____**
4. **What is the name we give these two things? _____**
5. **What will happen to the three items, when I release them? Explain why. _____**

   _____
6. **Which one will hit the ground first? _____ Why?**

   _____
7. **Describe how it fell to the ground. _____**

   _____
8. **Which item will hit the ground last? _____ Why?**

   _____
9. **Describe how it fell to the ground. _____**

   _____
10. **How do helicopters stay still in the air? _____**

    _____
11. **What makes a good paper helicopter? _____**

    _____
12. **Can you make different paper helicopters and decide which one is best? _____**

    _____
13. **What do you mean by best? _____**

    _____

Research:

As you watch the film, Flight, write down 5 facts that either confirm what you already know about flight *OR* is new information that you learned as you watched the film.

1.

2.

3.

4.

5.

Did watching this film raise any questions for you? Is their something you want more information about?

1.

2.

3.

Gravitational Field: The space surrounding a massive body in which _____ _____ body experiences a force of _____.

Air Resistance: The _____ that acts on something moving through _____.

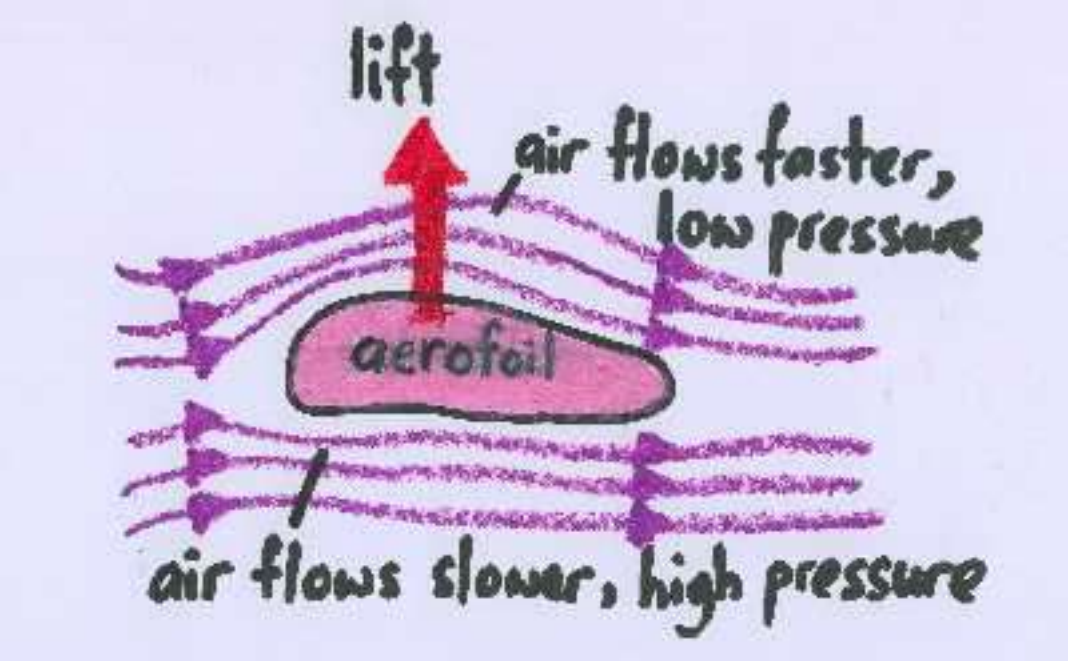
Pressure: The ratio of the amount of _____ to the area over which the force is _____.

Velocity: The specification of the _____ of an object and its direction of _____.

Bernoulli's Principle: Pressure of a fluid (air is a fluid) on a _____ decreases as the fluid's _____ relative to the surface _____.

Archimedes' Principle for air: Object surrounded by _____ is buoyed up by a _____ equal to the _____ of the air displaced.

Bernoulli's Principle:



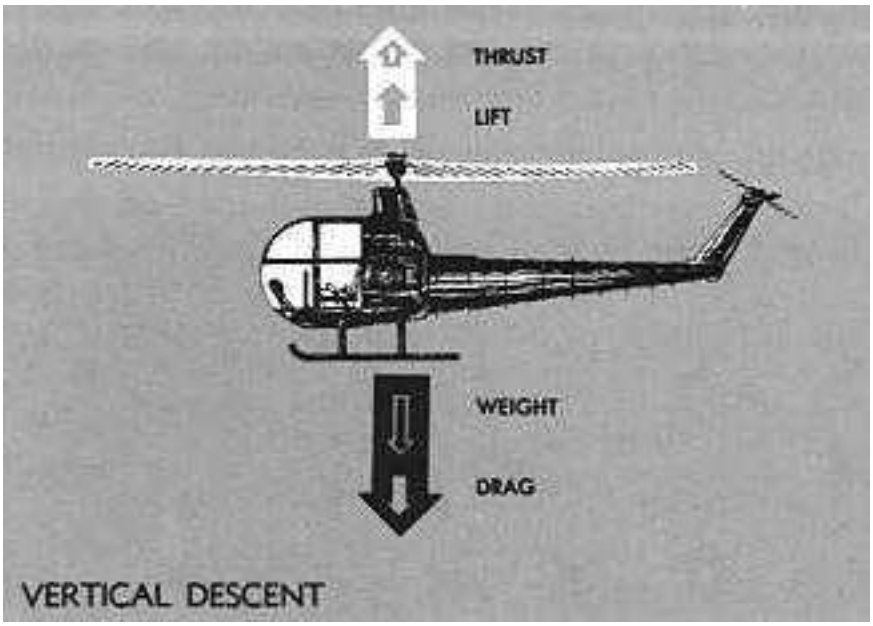
Vertical flight:

During vertical flight in a no wind condition,

Lift and thrust forces both act vertically upward.
Weight and drag both act vertically downward.
When lift and thrust equal weight and drag, the helicopter hovers.

When lift and thrust are **less than** weight and drag, the helicopter **DESCENDS** vertically.

When lift and thrust are greater than weight and drag, the helicopter rises vertically.



The Effect of a Paper Helicopter's Blade Length on Hang Time

Question: How does a paper helicopter's _____ affect that same paper helicopter's _____?

Hypothesis: The _____ the paper helicopter's blade length, the _____ the paper helicopter will hang in the air (the longer hang time).

Prediction: **If** a paper helicopter's blade length is tested to determine the longest hang time, **then** the _____ the paper helicopter's blade length, the _____ the paper helicopter will hang in the air, **because** _____ _____.

List of Materials:

- •
- •
- •
- •
- •
- •
- •
- •

Variables:

Independent (what will be changing)**:** _____

Dependent (what will respond to the change)**:** _____

Constants (what must remain the same)**:** _____ _____

Experimental Setup: (a labeled conceptual model of your experiment)

Procedure:

1. Prepare the _____ for flight. Cut on the solid lines and fold on the dotted lines.
2. Stand on a chair to _____ the paper helicopter from a height of _____.
3. Start the _____ when the paper helicopter is _____.
4. Stop the stopwatch when the paper helicopter hits the _____.
5. In the data table, record the number of _____ it takes for the paper helicopter to reach the ground. This is the paper helicopter's hang time.
6. Cut the ends of the blades at the Four.
7. Repeat steps two through five for the blade lengths of Four, Three, Two, and One.

Data:

The Effect of a Paper Helicopter's Blade Length on Hang Time

Wing Length	Trial One	Trial Two	Trial Three	Mean of Trials
Five				
Four				
Three				
Two				
One				

The Effect of a Paper Helicopter's Blade Length on Hang Time

Results: (Explain what happened in the experiment, observations made, and which paper helicopter had the longer hang time according to your table and graph) _____

_____

_____

_____

_____

_____.

Discussion:

1. Restate the Question.
2. State the Claim.
3. Explain the Evidence for the Claim (Summarize the data from the experiements).
4. Provide Reasoning of the Evidence (Compare the data to the hypothesis. Do the Results support hypothesis? Why?)
5. Discuss what was learned and what is the relationship between the variables.

_____

_____

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_____

_____

_____

_____

_____

_____

_____

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_____.

Reflection:

1. What went well with the experiment?
2. What were problems with the experiment?
3. What would be done differently in the experiment next time?
4. Based on the data and what was learned, what other questions are there to investigate?

_____

_____

_____

_____

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_____

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_____

_____.