

Feather Physics

Pre-class Activity



Up, Up, and Away!!

Introduction: Feather Physics is a great class for students to learn about the different forces of flight: Lift, Thrust, Drag, and Gravity. This activity will give students a chance to build their own airplane and then observe and answer some questions. The students will also go outside and observe the flight of birds around your school.

Directions:

Pre-class

- 1) Introduce the Red Bull Paper Wings Competition. This is an annual, international paper airplane championship. The competition crowns champions in three categories: distance, hangtime, and aerobatics.
- 2) Tell the class we will be holding our own contest. Each person will get a piece of paper only and make a creative paper airplane. Tell the students to look up different paper airplane designs online and practice folding at home. Some famous designs include but are not limited to: dart planes, Boomerang planes, speedster planes, and Suzanne planes.

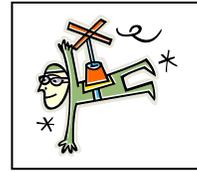
During class

- 3) Take a piece of paper and fold it to look like a plane. (*It may help to hand out different colored papers.)
 - Get creative; however, each fold is important. The plane needs to be perfectly balanced and any adjustment to the wings could keep the plane in the air longer or could make it come crashing down.
- 4) With your class, go outside and throw the paper airplanes.
- 5) Hold two contests: Longest air time, hang time, and longest distance. It is best to find an indoor area that is long and wide with as little wind as possible. Set launching line where to throw from.
 - For the distance it is best to leave the longest plane on the ground where it lies and have the shorter planes be picked up.
 - For hang time, just record the amount of time the planes stay in the air.
- 6) While the airplane is in the air/ still flying, the students need to **OBSERVE ALL THE THINGS THAT ARE HAPPENING TO IT. DON'T FORGET THOSE FORCES CAN BE SEEN!!!!**
- 7) They should observe other people's planes as well.
- 8) Once the students have flown their plane a couple times and observed what happened, answer the following questions on their own:
 - When you were testing your plane, how did it perform (time in air / distance)?
 - When it fell to the ground, what force caused it to fall?
 - Did your plane keep its initial speed throughout its journey? What happened to its speed as it flew?
 - Did the plane fly on its own or did you have to throw it? What gave your plane the power to stay in the air?
 - How do you think different designs affected performance? Why?
- 9) Briefly go over the answers and introduce the four forces that affect how flight works (Lift, Thrust, Drag, and Gravity). Have you folded your folds exactly on the lines? Why would that matter? Will it help decrease drag? Are your creases good? Can you tilt the wings a little to give you more lift? Why would that help?
- 10) Now that you have flown your airplane and written down your observations, take a look up in the sky. What forces are acting on the birds you see in the sky that also acted on your plane? Pick out one bird you see and answer the following questions:
 - When your bird is flying, what type of movements does it have? (For example: Is it just flapping its wings all the time, or does it just seem to float?)
 - Why is the bird you see not falling to the ground? How is it able to fly?

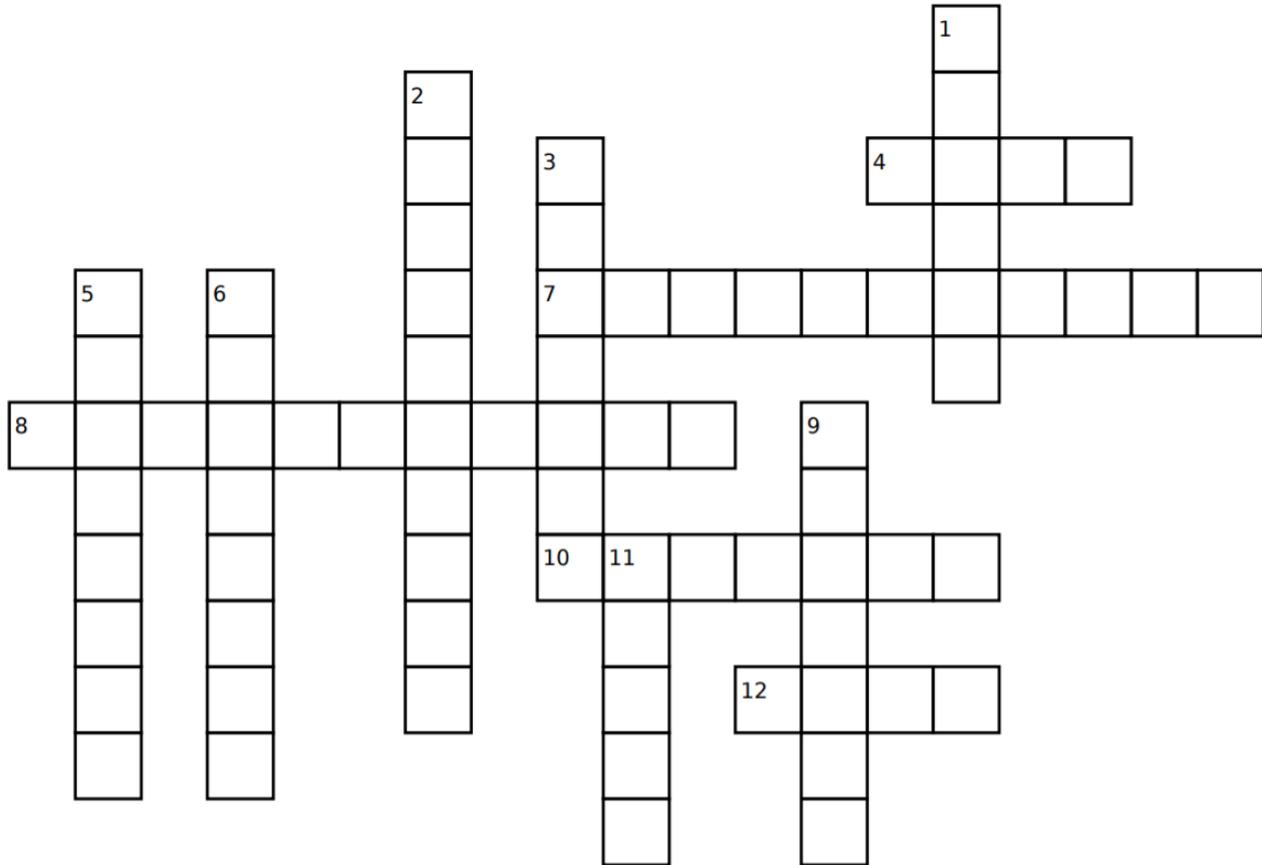


Feather Physics

Post-class Activity



Introduction: Now that you have learned about the forces that affect flight and the different types of flyers, let's review what you've learned.



Down:

1. A reaction force which causes motion
2. An increase in the velocity of a gas results in a decrease in pressure
3. The flight strategy where birds use thermal currents to gain lift
5. An adaptation that allows birds to fly but an adaptation other flyers do not have
6. The flight strategy where birds constantly move their wings
9. The flight strategy where birds both flap and soar
11. Hot air on Earth does this throughout the day

Across:

4. The resistance force created as an object moves, parallel and opposite to the object's motion
7. The force that results from many gases having mass and exerting a force
8. The flight strategy taking advantage of drag
10. The force of attraction between any two bodies that have mass
12. The upward force moving perpendicular to motion