



Name: _____

Date: __/__/_____(dd/mm/yyyy)

**Topic A: Air and Aerodynamics****Overview:**

Students explore the characteristics of air and the interaction between moving air and solids. They learn that air is a compressible fluid, that it is composed of many gases, and that moving air can support solid materials in sustained flight. By studying birds and airplanes, they learn a variety of adaptations and designs that make flight possible and that provide for propulsion and control.

General Learner Expectations

Students will:

6-5: Describe properties of air and the interactions of air with objects in flight.

Classroom assessment is divided into three types: assessment for learning (Diagnostic Assessment: D), assessment of learning (Summative Assessment: S), assessment as learning (F).

Lesson #	Curriculum Specific Learner Expectations	Lesson (s) Title	Agenda **	Done
1		→ Introductory Activities: What is air?	<input type="checkbox"/> WS: KLEW chart (D) <input type="checkbox"/> Introductory Activity: Mystery Bag (Master 1) (F) <input type="checkbox"/> Air and Aerodynamic PowerPoint (Throughout the unit) → Interactive PowerPoint notes	
2	1	→ Air takes up space and exert pressure	<input type="checkbox"/> Activity: Huff N' Puff - Lab book record (F) <input type="checkbox"/> Activity: Test Your Strength - Lab book record (F)	
3	2	→ Air is a fluid and capable of being compressed	<input type="checkbox"/> Demonstration: Feel the Force (F) <input type="checkbox"/> Activity: Air Powered Rocket - Lab book record (F)	
4	3 and 4	→ Introduced Bernoulli's principle	<input type="checkbox"/> Demonstration: Ball in a Funnel - Lab book record (F) <input type="checkbox"/> Activity: Blowing in the Wind (Master #6) (F) <input type="checkbox"/> Demonstration: Resist the Force - Lab book record (F)	
5	5 and 6	→ Flying animals	<input type="checkbox"/> Activity: Flying Things (Master 8) (F) <input type="checkbox"/> Activity: Getting Off the Ground (Master 12) – Computer research, poster and presentation (F) <input type="checkbox"/> Activity: Why Can't They Fly? (Master 14 and 15) - Computer research (F) <input type="checkbox"/> Activity: Thrust, Drag and Lift (Master 16)	
6	7	→ Understanding Streamlining	<input type="checkbox"/> Activity: Paper Drag - Lab book record (F) <input type="checkbox"/> Activity: Cutting through Air (F) <input type="checkbox"/> Activity: Streamline Your Performance (Master #17) (F)	
7	8	→ Air is composed of different gases	<input type="checkbox"/> Activity: Fruity Oxidation - Lab book record (F) <input type="checkbox"/> Activity: Lights Out (Master 20) (F)	
8		Unit Tasks:	<input type="checkbox"/> Task: (S) → Mind Map: Air and Aerodynamic → What's in the News? → Reflection on Learning: KWEL, I Can Statement, and How Did You Do? → Unit Portfolio: Air and Aerodynamic → Unit Test	

** If the class work is not completed during class time, must be done for homework.

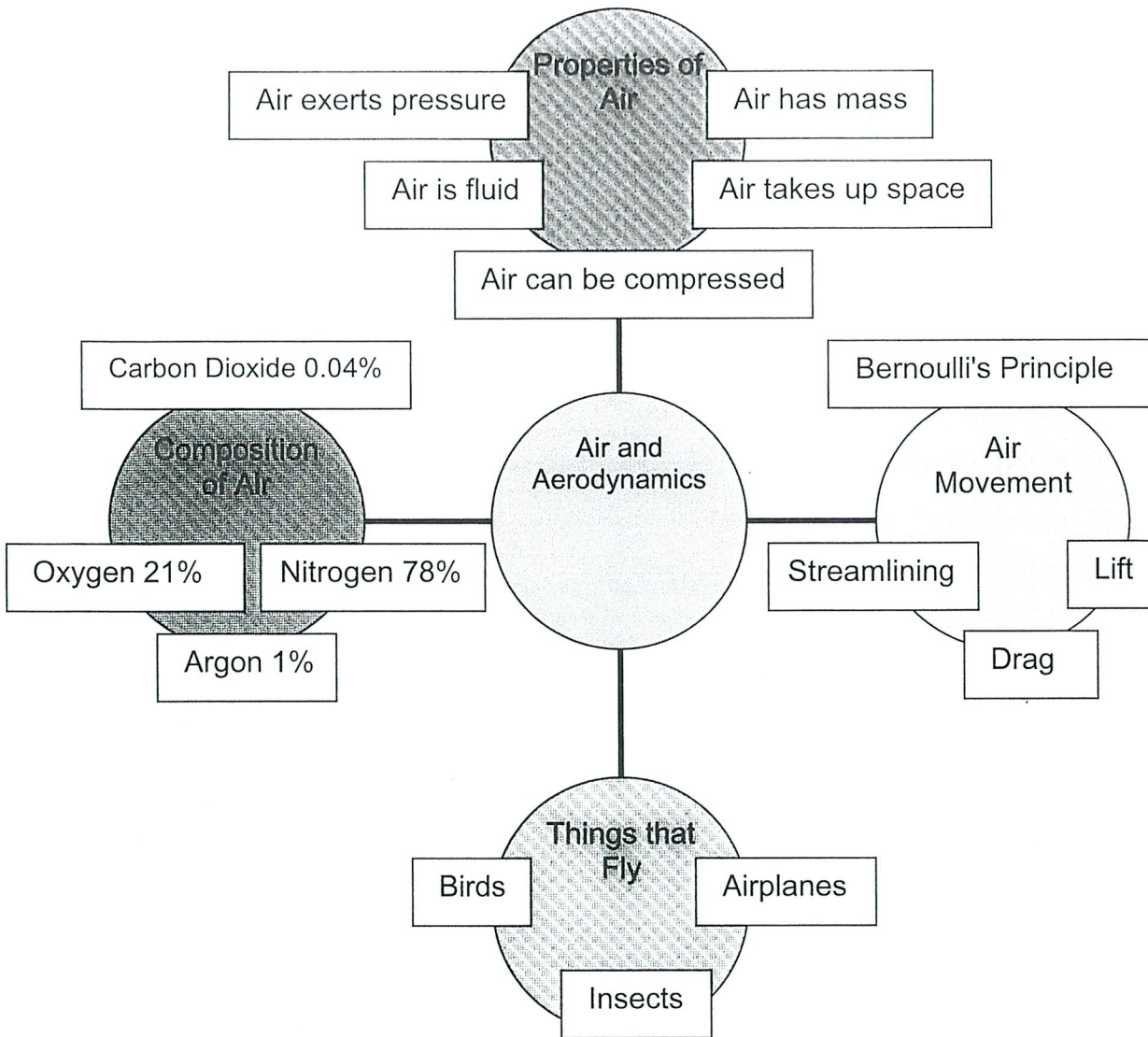
I have read and went over this "Air and Aerodynamic- Unit Plan" with my child. JazakAllahu khayran

Parent/Guardian name (print)

Parent/Guardian signature

--/--/-- (dd/mm/yyyy)

Graphic Organizer: Concept Map





Topic A: Air and Aerodynamics

K What We Think We Know	L What We Learned	E What Evidence We Have	W What We Still Wonder



Air and Aerodynamics:

Interactive PowerPoint Notes

Air has many properties. It is made up of gases, takes up space, has mass(weight), exerts pressure, living things need it to survive.

Air takes up space:

- Think of Basketballs, footballs, rugby balls, and balloons. Air takes up space giving these objects shape.
- Usually you can tell how much space air is taking up by the shape of an object. Example: blowing up a balloon, the space air is taking up changes as the balloon expands.

EXTRA NOTES:

UNDER PRESSURE:

- Air exerts pressure
- How do some objects hold their shape then? Let's think about the balloon again, the air outside of the balloon is exerting the same amount of pressure that the air inside is. Therefore, allowing the balloon to keep a constant shape. If the pressure was not balanced, then the balloon would burst.
- Atmospheric Pressure: Earth's gravity pulling on air towards EARTH. This puts pressure on your body.
- Why don't humans get crushed from atmospheric pressure? We are designed to handle the pressure and WE HAVE AIR INSIDE US to balance the pressure.

EXTRA NOTES:

Air is so Massive and Dense (Mass and Density):

- Mass refers to the amount of matter in an object
- Density refers to how tightly or how loosely packed the molecules of an object are.
- Density= mass/volume (D = M divided by V)
- Take two bottles of the exact same size. One is filled with water and the other with air. We know that the bottle filled with air is heavier, that is because water is denser than air. Water's molecules are closer together than air's.
- Two balloons are attached to a straw, one at each end. One is filled with air the other is not. What would happen to the straw? Which balloon would be heavier?
- What happens to air at sea level? How much pressure is air exerting? What about at the top of a mountain? How much pressure is air exerting there?

EXTRA NOTES:

Air is a Fluid:

- Air can expand, contract, or be compressed.
- Air is a fluid. Fluids are gases or liquids.
- The molecules in fluids are not fixed (they can MOVE AROUND and SLIDE PAST EACH OTHER)
- Fluids take the shape of whatever they are poured/put in to.
- Fluids flow from areas of high pressure to areas of low pressure.
- Pressure or temperature changes in fluids lead to density changes
- The warmer it is the further apart the molecules get (expand) making air less dense, the colder it gets the closer the molecules (contract) the denser air becomes
- Warm air rises because it is less dense than cold air

EXTRA NOTES:

Compressed Air:

- Air can be compressed (SQUISHED) into smaller spaces by forcing the molecules closer together than normal.
- Molecules that make up gases are far apart, so they can be compressed using pressure.
- Some examples: Aerosol Spray cans (hairspray), soccer balls, basketballs, bike tires, scuba tanks, power tools.

EXTRA NOTES:

BERNOULLI'S PRINCIPLE:

- AS THE SPEED OF A MOVING FLUID INCREASES THE PRESSURE WITHIN THE FLUID DECREASES
- The wing of an airplane is shaped like an airfoil. It is designed like this so that air flows over the top of the wing faster than it flows under the wing.
- Air pressure on the top of the wing would be lower and under the wing would be significantly higher causing a push on the wing upwards...CREATING LIFT!

EXTRA NOTES:

Forces of Flight:

- LIFT: An upward force on an object (it's what keeps a plane flying)
- THRUST: A force on an object that gives them a forward motion. (Propellers/engines on an airplane)
- DRAG: A force that acts to slow down an object as it moves. (Putting your hand out the window of your car vertically VS putting your hand out the window horizontally)
- Gravity: A downward force pulling an object to the ground. The heavier/more mass an object has the bigger the gravitational pull. (Airplanes are made of lightweight materials)
- Lift and gravity oppose each other
- Thrust and drag oppose each other

EXTRA NOTES:

Birds:

Birds have adaptations that allow them to fly:

- Feathers: This allows them to be more aerodynamic and tail feathers help them steer.
- Powerful Muscles: They are built to sustain the repetition and power needed for flight.
- Air Sacs: Located in the thorax and abdomen give the bird enough oxygen for flight
- Hollow Bones: Makes the bird light weight
- Wings: Allows the birds to achieve lift. They are curved at the top and flat on the bottom.

EXTRA NOTES:

Insects:

- Wings (sometimes two pairs of wings that overlap): made up of a thin membrane and have veins that run throughout. These veins supply extra support for the wings. There are no bones or muscle in insect wings.
- Large insects flap their wings up and down while smaller insects flap their wings in a figure 8 motion
- An insect's muscles for flight are found in the thorax. Since they are cold blooded insects can't fly until they are warm. As the weather changes and it gets colder insects are not able to warm themselves enough for flight.

EXTRA NOTES:

Propulsion:

- Propulsion gives an object the force to move forward.
- Propulsion is need for thrust
- Birds and insects use their wings
- Airplanes use jet engines or propellers

EXTRA NOTES:

Streamlining:

- MAKE SOMETHING AERODYNAMIC SO THAT IT DOES NOT CREATE DRAG or reduces drag.
- If you took two pieces of paper and crumpled only one which one would hit the ground first?
- The nose of a plane is pointed, smooth, and round so that it doesn't create drag, it allows air to flow easily over it.

EXTRA NOTES:

Gas:

- Air is a mixture of gases like nitrogen, oxygen, and argon.
- There are traces of water, and carbon dioxide
- Oxygen is needed for combustion, oxidization, burning. (peeled apples browns from the air, candle in an enclosed case will only burn till there isn't any oxygen left)
- Carbon dioxide is heavier than most gases and therefore sinks. It can be used to extinguish flames.

EXTRA NOTES:

Name: _____

Master #1

Date: _____

Mystery Bag

<i>Sense:</i>	<i>Observations:</i>
<i>See</i>	
<i>Hear</i>	
<i>Feel</i>	
<i>Smell</i>	
<i>Taste</i>	

- Is there a substance in the bag? Why or why not?

- Name the substance. _____
- Which sense was most useful in investigating the properties of the substance that was in the bag? Why?

Name: _____

Master #6

Date: _____

Blowing in the Wind

Structure	Prediction	Observations	Inferences
<i>Show with a drawing.</i>			
<i>Show with a drawing.</i>			
<i>Show with a drawing.</i>			

Name: _____

Master #8

Date: _____

Flying Things

Flying Animals			
Gliders	Self-propelled Fliers (with wings)		
<i>(animals needing a propelling force to get them into the air, usually by jumping)</i>	Birds	Other Animals	Insects

Aircraft

Gliders	Self-propelled Fliers (with fixed or rotary wings)	
<i>(aircraft needing an external propelling force to get them into the air)</i>	Jet	Propeller
	<i>(forward thrust generated by hot gases)</i>	<i>(forward thrust generated by air movement caused by spinning propellers, which are driven by engines)</i>

Name: _____

Master# 12

Date: _____

Getting Off the Ground

Make a poster to show how a _____ flies.

Other students will be learning from this poster so make it:

- accurate,
- interesting and
- informative.

The poster should have:

1. a clear diagram that illustrates how a _____ flies
2. labels indicating thrust, drag, lift, mass
3. labels pointing out specific flight adaptations (i.e. tail shape, wing shape ...)
4. three to five facts written in your own words and in point form about:
 - how the animal flies (i.e. wing movement, speed, distance ...)
 - its special adaptations for flight (i.e. streamline body ...)
5. a list of at least two sources of information including author, title, publisher and date
6. a descriptive and catchy title - so people will know right away what your poster is about.

This project is due on: _____

My goal is to earn _____ on this project.

Getting Off the Ground Cont'd

What does a good poster look like?

Name: _____

Date: _____

A 9-10/10

Diagram is:

- accurate
- detailed
- thrust, drag, lift, mass clearly labeled
- 3 or more special adaptation features clearly illustrated and labeled

Additional information about flight and aerodynamics:

- 5 or more points
- accurate
- interesting
- point form
- in own words

Referencelist

Title is:

- clear
- descriptive
- catchy and artistic

Over all:

- no spelling errors
- readable print

B 7-8/10

Diagram is:

- accurate
- detailed
- thrust, drag, lift, mass labeled
- 2 or more special adaptation features clearly illustrated and labeled

Additional information about flight and aerodynamics:

- 3 or more points
- accurate
- point form
- in own words

Referencelist

Title is:

- clear
- descriptive

Over all:

- less than 3 spelling errors

- readable print

C 5-6/10

Diagram is:

- accurate
- thrust, drag, lift, mass labeled
- adaptation features illustrated

Additional information about flight and aerodynamics:

- 2 or more points
- accurate

Referencelist

Title is:

- clear

Over all:
readable print

Name: _____

Master # 14

Date: _____

Why *Can't* They Fly?

Why can't penguins and ostriches fly?

	Penguins	Ostriches
skeleton		
mass		
body shape (diagram)		
wing structure (diagram)		
wing movement (i.e. speed, direction)		
feathers		
tail		
special adaptations for travel and speed		

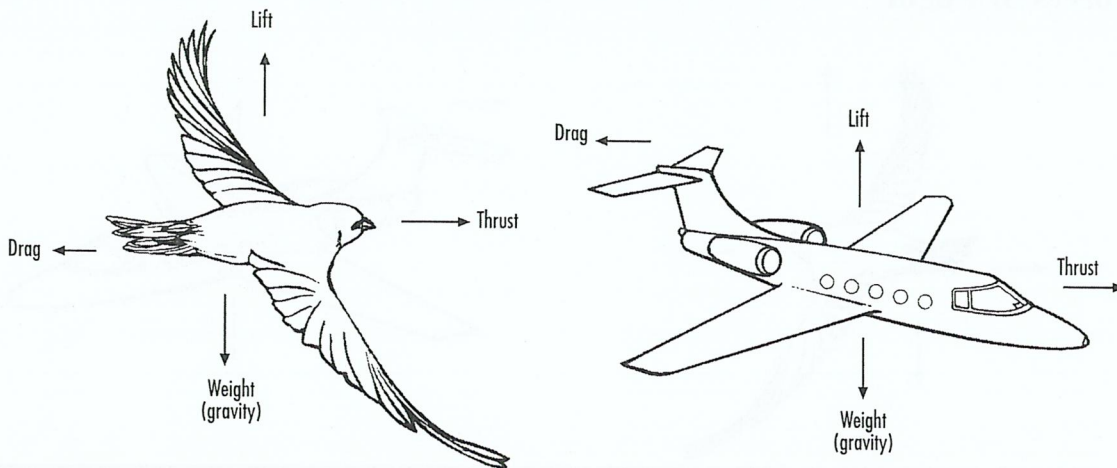
Name: _____

Master #15

Date: _____

Bird Wings and Airplanes

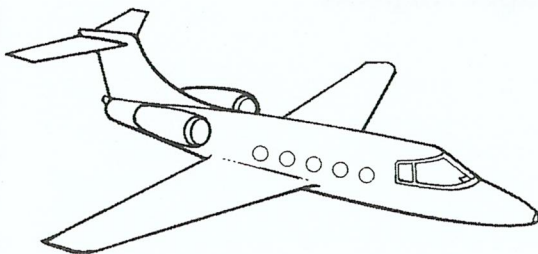
Four forces of flight:



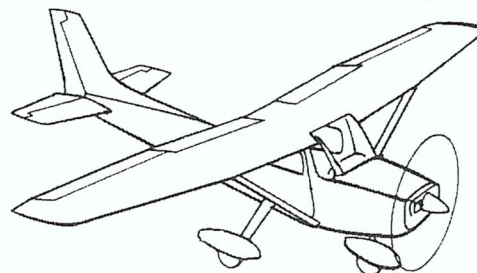
What an aircraft does in the air depends on the balance among the four forces involved in flight. If the lift is greater than the weight, the plane will go up. If the thrust is greater than the drag, the airplane will speed up. If the lift and the weight are equal, and the thrust and drag are equal, the airplane will fly at a steady height and speed.

Aircraft use two basic forms of propulsion- the propeller and the jet. Propellers will be driven by an engine while the jet works on the principle of forward thrust generated by hot gases.

Jet



Propeller

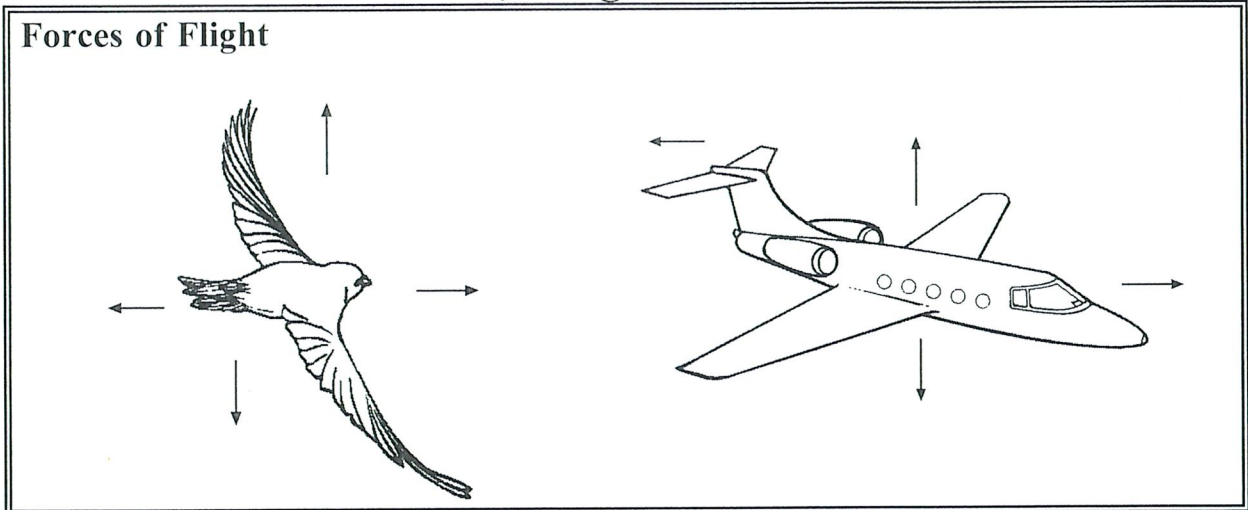


Name: _____

Master # 16

Date: _____

Thrust, Drag and Lift



Draw and label the forces of flight for the following:

Bird	Helicopter
Hovercrafts	Paper Airplane

Thrust, Drag and Lift Cont'd

Imagine an airplane flying through the air. Use what you know about lift, drag, mass, and thrust to tell what will happen to this airplane.

If lift becomes greater than mass, the plane _____.

If thrust becomes greater than drag, the plane _____.

If thrust becomes less than drag, the plane _____.

If lift becomes less than mass, the plane _____.

If lift, mass, thrust, and drag become equal, the plane _____.

_____.

Name: _____

Master #17

Date: _____

Streamline Your Performance

Drag is an obstacle in many sports, and the faster the sport, the greater the drag.

Drag is the resistance you feel when you skate, ski, bicycle, or run faster. You encounter drag as you move through the air or water. Drag opposes motion.

Find out how these athletes make modifications to “streamline” their performance.

Modifications to *reduce* drag

	clothing	equipment	body position	other
skier				
cyclist				
swimmer				

Modifications to *increase* drag

wind surfer	
sky diver	

Name: _____

Master # 20

Date: _____

Lights Out

How long will the candle burn?

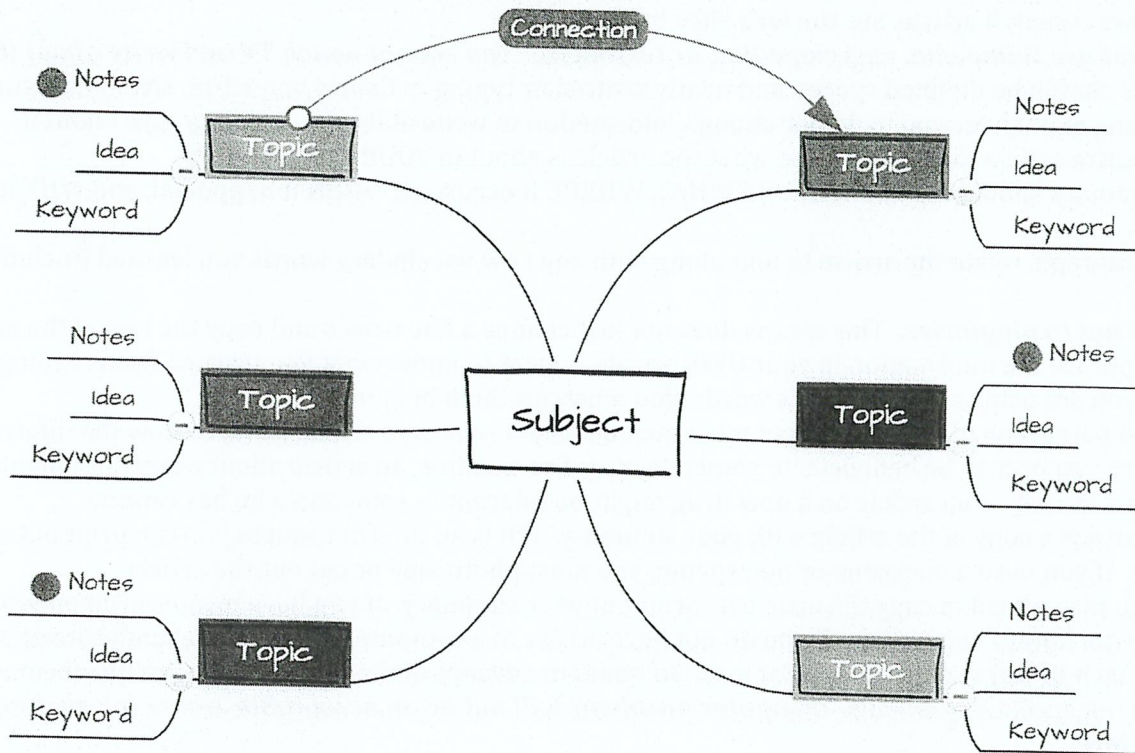
Size of jar	Prediction	Observation
small		
bigger		
biggest		

Inference (*Why* did the candles burn at different rates?)



Topic A: Air and Aerodynamics Mind Map

→ **Task:** You use the following information as guideline to create your mind map (*words and illustration*).



Name: _____

Date: __/__/____(dd/mm/yyyy)

Topic A: Air and Aerodynamics
What's in the news?



Purpose: The purpose of this assignment is to encourage students to connect what we are learning about in science class to the bigger picture.

Task: In this current events assignment, you will find, read and write a 2 paragraph summary of a science news article.

Procedure:

1. You will need to choose a science news article from a magazine, newspaper or Internet. To find an interesting science news research article. See the web sites below.
2. **You may not use Wikipedia, encyclopedias, or textbooks. You cannot watch TV and write about it.**
3. Paragraphs should be doubled spaced and neatly written or typing in Calibri at a 12-pt. size. Make sure the article is long enough for you to gather enough information to write at least two paragraphs about it.
4. Read the entire article then summarize what the article is about in YOUR OWN WORDS.
5. A good summary should include WHO did WHAT, WHERE it occurred, WHEN it happened, and WHY it is important.
6. Second paragraph, relate the article to unit along with any new vocabulary words you learned (include meaning).
7. **Be careful not to plagiarize.** This means does not just change a few words and copy the rest of the article. You need to rephrase the information in your OWN words. I want to know what you learned from reading the article. If you are using someone else's words, you must put them in quotes.
8. The second paragraph of the assignment must include why it relates to science and/or how the information was beneficial to you or may be beneficial to someone else. For example, an article about pesticides might be relevant to a farmer or an article on a new drug might be relevant to someone who has cancer.
9. You must attach a copy of the article with your summary. If it is an internet source you can print out a copy of the article. If you used a magazine or newspaper, you must photocopy or cut out the article. You need to plan ahead to copy the article or print out your summary. If you have printer problems, you may use the school library computers. If you do not have access to a computer, you need to handwrite or save the file (e.g. USB Flash Drive) and bring to me at least 48 hours in advance of the due date to print the document for you. I will not accept any e-mails. **Computer problems will not be an acceptable excuse for an assignment turned in late.**

Where do I find a science research article? (Possible Web sites):

Popular Science http://www.popsci.com/	http://www.sciencenews.org/
Discovery Magazine http://www.discovery.com/news/news.html	http://science.nasa.gov/ www.sciencedaily.com (higher level)
www.eurekalert.org/kidsnews/ (short and easy - must have my permission)	www.sciencenewsforkids.org (short and easy - must have my permission)
Time Magazine for Kids - Science http://www.timeforkids.com/news-archive/Science	Scientific American http://www.scientificamerican.com



Topic A: Air and Aerodynamics

I can...	4	3	2	1
I can explain how I know air is made up of many gases and provide evidence for different gases.				
I can provide evidence that air takes up space, has mass, and identify examples of these properties in everyday life.				
I can provide evidence that air exerts pressure and identify examples of these properties in everyday life.				
I can provide evidence that air is fluid and can be compressed. I can identify examples of these properties in everyday life (expanding and contracting air)				
I can describe Bernoulli's principle and demonstrate where air movement across a surface results in lift.				
I know that all living things or objects that fly, must have sufficient lift to overcome the downward force of gravity.				
I can identify 4 adaptations which enable birds and insects to fly.				
I can describe how flying animals and aircrafts propel				
I can describe what streamlining means and why it is necessary to overcome drag.				
I can predict how drag will affect aircrafts and can changes to an aircraft can reduce drag.				
I can explain how I know air is made up of many gases and provide evidence for different gases.				

