Name: ______________________________

BLRA Science Fair Timeline
2014- 2015

The science fair is required for all 6th through 8th grade students. Checkpoints and due dates are outlined below. There will be some class time to prepare and work on the project; however, the majority of the work may need to be completed by the student at home. The science fair will be held at BLRA on November 21, 2014.

Date	Requirement/Checkpoint
August 15	• Introduce requirements (need composition book and folder) • Brainstorm topics
August 22	• Final topic approved • Problem identified, Hypothesis and Purpose stated • Learn to write an introduction
August 29	• Hypothesis, question, and purpose DUE • In class, learn how to research • Introduce how to cite sources and make bibliography
September 5	• Draft copy of introduction is due • 5 correctly cited types of research (bibliography) DUE (from books, internet, magazines, etc....) • Teach experiment design (Materials, Procedures, Controls, Variables) • Introduce how to write Introduction (rough draft)
September 12	• Experimental design due • In class, work with Excel to make data tables. • At home, begin experimenting: o 3 trials of experiment need to be completed by October 18
September 19 September 26	• Final Introduction due • Data table check • Introduce how to write a conclusion • Experiments completed by October 18 • E-Learning Day • Work on bibliography • Bibliography due in class on September 29
October 3	• Data table check • In-class Work day • Introduce display board requirements

October 10	• E-Learning day • Specific assignments TBA
October 17	• Experiments **completed** • Rough draft conclusion DUE • Data DUE in data tables • Learn how to make graphs from data tables
October 24	• Learn to write an abstract
October 31	• Abstract DUE • Final conclusion DUE
November 14-	• Final Copy of report due with Lab Journal
November 20 (Thursday)	• Final display Board due
November 21 (Friday)	• Science fair

The award assembly for the winners will be held at BLRA on November 21 at 4:00. The top three winners for each grade in each category will be invited to register for the regional science fair that will take place in the spring at the UCCS campus.

Vocabulary – Scientific Method

Abstract - a brief overview of the investigation

Accuracy - the extent to which a given measurement agrees with the standard value for that measurement. (Example: Bulls eye – Darts)

Analyze - to examine closely by separating into parts and studying their relationships

Anomalous data (extraneous; outliers) - data that seems to be inconsistent or contradictory to the pattern established by additional data; determined by a statistical method

Bar graph - a type of graph used for descriptive data that comes from research questions asking about variables that will be counted

Conclusion - summarizes the important parts of an experiment using the data that best answers the question; data supports or refutes the hypothesis

Constant factors - the factors of a scientific experiment that are held the ***same*** while the study is being completed

Control - a standard used for comparison; the "norm"

Data - factual information, especially information organized for analysis or used to reason or make decisions (datum – singular)

Data analysis (interpretation) - making sense of observations and data collected during an experiment using appropriate math concepts (mean, median, mode, range, random error, % loss) and by looking at patterns and relationships between the independent variable and the dependent variable

Data table - organizes data into rows and columns

Dependent (responding) variable - the response to the independent variable that can be ***measured*** (quantitatively) or observed (qualitatively)

Hypothesis - an educated explanation (answer) about a question based on research; a prediction that discusses how the independent variable will affect the dependent variable

Independent (manipulated) variable - variable ***changed*** by the scientist; what the investigator is testing

Line graph - a type of graph used when data has taken place over time

Observations - anything noticed

- ***Direct*** – looking at the actual behavior or occurrence; the researcher ***is*** the observer
- ***Indirect*** –the result of an occurrence that cannot be directly viewed in which the researcher infers what happened to cause the occurrence

Operational definition - a description of the method used to measure the dependent variable to include the tool(s) and the unit(s)

Precision - the extent to which a given set of measurements of the same sample agree with their mean; random error (Example: the grouping pattern of darts)

Procedure - a numbered, step-by-step set of directions written to conduct an investigation and to identify what data will be collected

Random error - clearly states the precision or uncertainty of trials

Rating scale - a developed numerical scale to quantify observations when no standardized measurement exists

Scientific method - a series of steps used by scientists/people to help find solutions to problems and/or questions

Trial - one test of an independent variable

Variable - anything that can be changed in an experiment that could affect the results of the investigation

Editing Marks

Mark	Meaning	Mark	Meaning
≡	capitalize	p/a agr.	pronoun/antecedent agreement
P.	punctuation	r.	repeat/repetitive
^	word/letter left out	(t.)	relate back to thesis statement
sp	spelling	∽	transpose
/	lowercase this letter	+ tr.	need transition
frag.	sentence fragment	#	indent
Ro	run-on sentence	⁐	close up
n.c.	not clear	?	confusing
◯	this is wrong	exp.	explain/elaborate
∂	delete	c	no contractions
awk.	awkward	#	spell out one-digit numbers and any numbers that are the first word of sentence
wc	word choice		
||	not parallel		
s/v agr.	subject/verb agreement		
t.	verb tense		

Scientific Journaling

The journal is your most treasured piece of work. In any experiment, a scientist must make observations and record ALL relevant data pertaining to the experiment. The journal begins as soon as a question is approved. A journal entry should be completed every time you work on the investigation. Examples include shopping for supplies (include receipts), writing a hypothesis, or brainstorming ideas.

NOTE:

- ALL journal entries are written in blue or black ink pen.
- The first rough draft is ALWAYS handwritten in the journal – then typed!
- Editing marks/revisions are written in red ink pen.
- *Do NOT write on the back of the pages; only write on the right side of the opened journal.*

Your journal should include the following:

1) Date of each entry (left margin)
2) The question
3) Rough drafts of each step to include red ink mark-ups
    - Skip lines in order to leave room for revisions.
4) Notes or summary information pertaining to research
5) What you did that day
6) What you learned
7) Observations - What you saw, heard, felt, and smelled; Use your senses.
8) Anything unexpected that happened
9) Problems encountered; Solutions to problems
10) Drawings that might help explain the investigation
11) Measurements from the experiment organized in a data table
12) Plan(s) for the next day

Expectations - Journal

- € Handwritten
- € Dated entries
- € Completed in pen (blue/black ink only); NO white-out
- € Mark-ups with arrows, rewrites, etc. (Use red ink for revisions)
- € Rough drafts of each step
    - € Question
    - € Background Paragraph
    - € Vocabulary
    - € Purpose
    - € Variables
    - € Constants
    - € Operational Definition
    - € Hypothesis
    - € Materials
    - € Procedure
    - € Table
    - € Graph
    - € Data Analysis
    - € Conclusion
- € Detailed/Factual notes (no opinions)
- € Sentences/Phrases/Drawings/Observations/Brainstorms
- € Problems/Solutions
- € Data table with measurements
- € Graph – rough draft

Journal Examples

10-4-10

Rocks

Sedimentary

-formed out of sand, shells, pebbles, bones, minerals (excluded sediment) ←

-accumulates in layers over time turns to rock

-Generally [illegible]

-usually only type of rock that contains fossils

example: limestone

-organic sediments - shells or skeletons and other forms of once living things

-Chemical sediments - minerals that dissolve in water

-Clastic sediments - rock fragments

Metamorphic

-formed ~~[illegible]~~ under Earth's surface

-develop due to chemical and ~~physics~~ physically change

of an old rock due to ← temperature, pressure or [illegible]

10-5-16 (Continued)

is generally soft and is known to crumble easily.

Usually, it is the only rock that contains fossils.

an example of sedimentary rock is
Limestone ~~is an example of sedimentary rock~~. When

Sedimentary rocks are covered with more sediment

the sediment is pushed deeper
and ~~[illegible]~~ pushed deeper into the earth. This

heat and pressure produces a new type of rock.

Metamorphic Metamorphic rocks are formed under

the earth's surface. These rocks develop ~~due to~~ when an

older rock undergoes chemical and physical changes
~~chemical and physical changes of an older rock~~ due

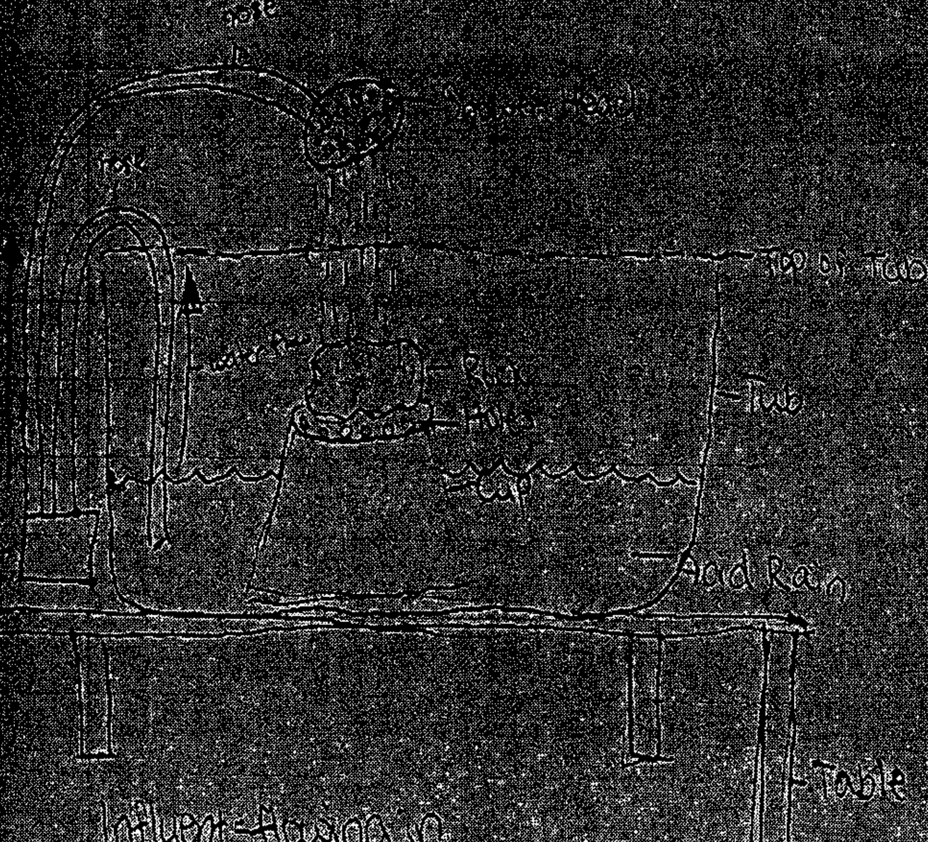
10-25-10 (Continued)

If the mineral is harder ~~proven by it~~ the Mohs scale (as measured using the) ~~it is~~ (the rock is less) likely to not weather ~~as much~~ (than acid rain; however, different) types of rock will weather faster depending on what minerals make up the rock. Acid rain compared to normal rain accelerates the weathering process.

10-31-10

Project Design (Acid Rain Simulation)

Develop a create ... simulate ... acid rain ...



Influent = flowing in

Rock	Trial	Volume (cm³)	Mass (grams)	Control	Volume (cm³)	Mass (g)
Sandstone (Sedimentary) Colorado Moss SM (240-250) (239-246)	1	~~100~~	245.7 252.2	1	~~100~~	243.6 243.5
	2	~~100~~	239.4 240.0	2	100 ~~100~~	245.6 245.5
	3	~~100~~	242.3 242.2	3	~~100~~	245.5 ~~250~~
	4		250.6 ~~250.9~~ 242.0	4	30.9	253.8
	Mean		242.1			247.6
	Median		242			245.5
	Mode		n/a			n/a
	Range		6.3			10.3
	Random Error		4.5			7.2

Rock	Trial	Volume	Mass	Control	Volume	Mass
Limestone (Sedimentary) Siloam Stone SS (233-245)	1	~~100~~	238.3 239.7	1	~~100~~	243.4 244.4
	2	~~100~~	234.7	2	~~100~~	232.8 233.0
	3	~~100~~	~~244.7~~ 244.3 243.9	3	~~100~~	~~244.8~~ ~~244.9~~ 249.7
	4		242.1	4		243.3
	Mean		238.8			240.3
	Median		338.3			443.4
	Mode		n/a			n/a
	Range		9.7			12
	Random Error		6.9			8.5

BLRA Science Fair – 2014-2015

Why do a science fair project?

Participation and preparation for a science fair will help you develop several valuable skills. You will not only learn more about science, but you will learn more about the use of the library, how to properly collect and analyze data, and how to communicate your data to others. You may also discover an interest that may one day lead to pursuit of knowledge well beyond high school.

Before you begin...

A science project is an investigation using the scientific method to discover the answer to a scientific problem. You need to recall the steps of the scientific method before starting your project.

1. Research – collecting information from your own experiences, knowledgeable sources, and other data.

2. Identify a Problem – the scientific question to be solved.

3. Develop a hypothesis – an idea about the solution to a problem, based on knowledge and research.

4. Experiment – the process of testing a hypothesis.

5. Analyze your data – record what happened during the experiment and organize the data.

6. Conclusion – was your hypothesis correct? This is a summary of the results of the project experimentation and a statement of how the results relate to the hypothesis.

7. Communication – communicate your results to others.

First, choose a topic (research)

This step is not only the first, but often times the hardest step to overcome. You must come up with a topic that interests you. You may get ideas from the environment around your home, newspapers, magazines, or television. You may also check science fair idea books and science textbooks that contain lists of project work. A librarian may also assist you in your search for a topic at the library. There are hundreds of ideas to choose from, you just need to pick one of interest to you!

Second, narrow your topic (identify problem)

Many topics are too broad and will need to be narrowed down. For example, wanting to investigate the question "How does light affect plants?" encompasses far too much information to present at a science fair. A better choice may be to investigate the question "How does light affect the germination of bean seeds?"

The best way to narrow your topic is to learn more about your subject. Once you gain enough knowledge, you will be able to define a specific problem. Use the library, other students, your teachers, and your parents to assist you in this process.

Also, keep in mind that you need to choose a problem that can be solved experimentally. Asking the question "What is a flashlight?" can be answered by looking up the word *flashlight* in the dictionary. "What makes a flashlight bulb glow?" can be answered by experimentation.

Third, propose a solution (hypothesis)

After you identify the problem you will be attempting to solve, you must propose a possible solution to your problem. This is the key to a successful project. All of your project research is done with the goal of expressing a problem, proposing an answer to it – the hypothesis, and designing project experimentation. Then, all of your project experimenting will be performed to test the hypothesis. The hypothesis should make a claim about how two factors relate. Make sure that you state facts from past experiences or observations on which you based your hypothesis and write down your hypothesis **before** beginning the project experimentation. **DO NOT** change your hypothesis even if experimentation does not support it. If time permits, repeat or redesign the experiment.

Fourth, design your experiment

You must devise a logical, orderly way to test your hypothesis. No matter how sure you are of your probable hypothesis, it cannot be accepted until it is tested many times. The things that have an effect on the experiment are called variables. The *independent variable* is the variable that you purposefully change. The *dependent variable* is the variable being observed that changes in response to the independent variable. The variables that are not changed are called *controlled variables.*

To be sure that outside factors don't affect the outcome of an experiment, a **control** must be set up. In a control, all variables are identical to the experimental setup – your original setup – except for the independent variable.

For example, if testing the question "How does light affect the germination of bean seeds?" the independent variable is light and the dependent variable is seed germination. Type of soil, type of container, amount of water, type of seeds, and temperature are controlled variables. In order to set up a control, plant 3 or 4 different beans, one bean per container. Place in a dark place and wait to see if seed germination occurs or not. The control group of plants would be set up the same way as the experimental group, but they would receive sunlight to determine if seeds would grow with light.

Make sure that you: have only **one** independent variable, repeat the experiment more than once (at least 3 trials are needed), organize data, and have a control.

Fifth, analyze your data and prepare your project conclusion

As you experiment, your job is to observe and to record what happens. In order to best do this, keep a lab journal. Do not use separate loose-leaf pages, as they can easily become lost or disorganized. This notebook should contain not only your original ideas but also ideas you get from printed sources or from people. It should also include descriptions of your explanatory and project experiments as well as diagrams, graphs, and written observations of all your results. Entries should be neat, dated, and orderly to provide a complete and accurate record of your project from start to finish. When organizing and analyzing data, use graphs, tables, and charts. These may include bar graphs, lines graphs, pie charts, or pictographs.

You may find that your hypothesis was not supported during your experiment. If this happens, it is time for revision. Walk yourself through the following steps:

First, check to make sure that you followed the experimental procedure correctly. If there were no procedural mistakes, check the experimental design. Was the experiment controlled? Did this experiment reflect the hypothesis? If yes, then you need to look at the hypothesis. Perhaps the hypothesis wasn't a possible solution. If you are still having trouble, then it's a good time to ask for help. **DO NOT** change your hypothesis or leave out experimental results that do not support your hypothesis. **DO** give possible reasons for the difference between your hypothesis and the experimental results and give ways that you can experiment further to find a solution.

The project conclusion needs to be a written summary of the results of the project experimentation and a statement of how the results relate to the hypothesis.

Sixth, reporting your results (communication)

Your report is the written record of your entire project from start to finish. The report should be clear and detailed enough for a reader to know exactly what you did, why you did it, what the results were, whether or not the experimental evidence supported your hypothesis, and where you got your research information. Much of the report will be copied from your journal. By recording everything in your journal as the project progresses, all you need to do in preparing the report is to organize and neatly copy the journal's contents. Tables, graphs, and diagrams should be neatly and colorfully prepared. If possible, use a computer to prepare some or all of these data displays.

Your project report needs to be typed (12 font), double-spaced, and bound in a folder. It needs to contain a title page, a table of contents, an abstract, an introduction, the experiments and data, a conclusion, and a bibliography (sources used during research)

Title Page:

The first page should contain an attention getting title, your name, grade, and the date. Center the title in the middle of the page. **This page does not get numbered**. Example:

"To Float or Not to Float"
Bob McBob
Science 6A
November 2, 2012

Table of Contents: **This page does not get numbered. Example:**

Table of Contents

Purpose

The purpose is one to four sentences that restate the question in a declarative sentence, as well as explaining the importance of the investigation. The purpose should relate to a real-world application.

- Begin the first sentence, "The purpose of this investigation is to test/explore/discover/examine/find out/determine ...." (Restate question)
- The second sentence could begin, "This investigation is important because ..." or "This information would be beneficial because..."
  - Why is this investigation important? Who can benefit?
    - SAVE THE WORLD!
  - The third (and possibly a fourth) sentence is an elaboration of the second sentence for clarification or detail (if needed).
- The purpose should not be more than four (4) sentences.

Variables

Anything in the experiment that could be changed and affect the results of the investigation is a variable. Setups of an experiment should have only one variable that is changed at a time. By having only one variable that is changed, you can be fairly certain that the results of the experiment were caused by that one variable. Three types of variables are explained below:

- **Independent variable (the 1 factor manipulated - CAUSE)** - what the investigator is testing; the <u>**ONE**</u> thing that is <u>changed</u> or manipulated by the scientist.
- **Dependent variable (the 1 factor measured - EFFECT)** – the response to the independent variable that can be <u>measured</u> (quantitative) and/or <u>observed</u> (qualitative).
- **Constant factors (many)** – Factors (rules) that are kept the <u>same</u> or constant throughout the experiment. The scientist keeps them constant so that they will not interfere with the investigation.
- **Control (one)** ***the "norm"*** - a standard used for comparison

Operational Definition

– ***To operate the experiment, one must define how to measure the dependent variable!***

One of the important decisions a scientist must make is to determine how measurement of the variable will be made. The <u>**method, tool(s), and unit used to measure**</u> the <u>**dependent variable**</u> is called an <u>**operational definition.**</u> Once a scientist has decided on a method, that method must be reported to other scientists, so they can test the investigation results. Any scientist can read an operational definition and easily understand or perform the same measurement.

Hypothesis (Inference)

A hypothesis is an <u>educated</u> explanation (answer) about a question based on research. This inference discusses how the independent variable will affect the dependent variable. Hypotheses express a <u>**logical**</u> explanation based on observations, background information, or other scientific knowledge. Hypotheses can be tested. Investigators find them useful because they specify an exact focus for an experiment. A hypothesis is a minimum of two sentences.

Writing a Hypothesis
Do not use the words "I think". The hypothesis can be written using the "If…, then…." format. This format, while not always necessary, is a helpful way to learn to write a hypothesis. Using the words "increase" and "decrease" (if possible) also adds details to the hypothesis and refines the prediction. Remember to be as specific as possible when describing the changes in variables. Avoid a "wimpy" hypothesis by being too vague. Include a second sentence using background information, prior knowledge, or personal experience to support the hypothesis.

Hypothesis Format:
***If* _________ *is* _____________…, *then* __________*will* __________________________.**
(independent variable) (increased/decreased/varied) (dependent variable) (increase/decrease/vary/fluctuate/stay constant)

2nd sentence starter phrase
- Based on research…
- Research indicates…

Materials

List all materials used in the investigation, including what might be needed to build.
- The materials are written in an unnumbered list or in a table.
    - Include the amounts of each item, the item, and brand names/sizes when appropriate.
- **Be sure to use only metric units** (meters, grams, liters).
    - Use metric conversion tools on the internet (also available on the 7th grade website) and round the converted answer to the nearest tenth.
    - Exception: Building materials (bolts, screw, wood, etc.) can be listed using customary units.
- *Inches, feet, pounds, cups, etc. are **not acceptable**.*
- **Brainstorm** the materials and amounts you will need of each material for your investigation, and write them in the journal.
    - **The number of trials you do will dictate the amount of materials you will need.**

Procedure

- The procedure is like a recipe.
    - Other scientists who read the procedure will be able to duplicate the investigation and get the same results.
- The procedure is a numbered, step-by-step set of directions for conducting the experiment.
- The steps are sequential, easy to follow, and detailed.
- Only the steps that are actually part of the experimental design are included.
- Use imperative sentences.
- Do not use paragraphs.
- Brainstorm the steps in your journal to begin the procedure.

The procedure includes the following:

- Begin each sentence with a verb. Do not use personal pronouns.
- Number each step.
- Independent/Dependent/Constant variable(s)
- Operational Definition (unit)
- Tools used to measure the results
- How many times the experiment is being repeated
  - Minimum of 3 trials; 5 ideal
  - Human subject experiments -minimum 50 human subjects (or 25 in each subgroup)
  - Sports question (historical statistics) – minimum of 20 games
- ALL materials listed must be somewhere in the procedure
- Safety considerations
- Additions/revisions as needed while doing the experiment
- Include detailed photographs/drawings of self-designed equipment

Helpful Verb Starters

Add	Compute	Drill	Label	Predict	State
Accumulate	Compile	Dissect	Indicate	Position	Sort
Acquire	Compose	Distinguish	Install	Pour	Specify
Adjust	Conduct	Drill	Introduce	Prepare	Square
Align	Construct	Dye	Kick	Present	Stabilize
Alphabetize	Consume	Erect	Leave	Produce	Submerge
Analyze	Contrast	Estimate	Listen	Pronounce	Subtract
Apply	Convert	Evaluate	Locate	Push	Suggest
Arrange	Coordinate	Explain	Magnify	Put	Surround
Assemble	Correct	Extrapolate	Make	Read	Survey
Attend	Count	Fasten	Maneuver	Reconstruct	Swing
Balance	Cover	Fill	Manipulate	Reduce	Tabulate
Bind	Crumble	Find	Match	Remove	Take
Bisect	Crush	Fit	Measure	Repair	Throw
Blend	Cut	Fold	Modify	Revise	Tilt
Blow	Deduce	Freeze	Monitor	Roll	Time
Build	Defend	Generate	Multiply	Rub	Toss
Calculate	Define	Graph	Name	Sanitize	Translate
Carve	Demonstrate	Grasp	Observe	Scatter	Type
Categorize	Derive	Grind	Operate	Screw	Underline
Choose	Describe	Hammer	Order	Select	Verbalize
Classify	Design	Hang	Organize	Sketch	Verify
Color	Designate	Hit	Outline	Ski	Weave
Combine	Determine	Hold	Pack	Skim	Weigh
Compare	Diagram	Identify	Paint	Solve	Write
Complete	Dispose	Illustrate	Plot		

Perform Experiment

When performing the experiment, read the procedure and follow the steps as outlined. Make revisions/additions as needed while doing the experiment. This is the only way to know if the procedure, as written, can be performed by someone else.

Scientific Journaling (see previous notes)

Journal everything! In any experiment, a scientist must make observations and record ALL relevant data pertaining to the experiment. Good notes show consistency and thoroughness!

Tables and Graphs

Before conducting a meaningful investigation, it is important to figure out how to organize the data. By organizing data, a scientist can more easily interpret what has been observed. Making sense of observations is called *data interpretation.* Quantitative data is organized using tables. A data table organizes data into rows and columns. Graphs are created from data tables. They allow the investigator to get a visual image of the observations which simplifies interpretation and drawing conclusions. Since drawing conclusions are the final step of any investigation, tables, graphs, and data interpretation are extremely important.

- **Valid conclusions depend on good organization and clear interpretation of data.**

Data tables are relatively simple to make and convey information with precision. Tables make the information easier to analyze. Additionally, tables form the basis for most graphs.

- All data tables have a **title** that includes both the independent and dependent variables.
- When making the data tables, **column headings** are used to organize the table.
- A table must show the independent variable and the number of trials.
- The table usually includes the mean, median, mode, range, random error, percent lost, and/or precision of data.

- **HINT: Create a table in your journal to collect data PRIOR to performing the experiment.**

Title:

	Dependent Variable ( )							
Independent Variable	Trial 1	Trial 2	Trial 3	Mean	Median	Mode	Range	Random Error

Data Analysis

The data analysis is one of the most important parts of any investigation. This is where you make sense of the experiment and the results. This part is only a discussion of the data. ***Do not discuss the original question.***

- Look at the data (tables and graphs).
- Use appropriate measures (mean, median, mode, range, random error, percent loss/gain). This is included in the original data table. .
- Explain and discuss the patterns and relationships between the independent variable and the dependent variable. How did the independent variable affect the dependent variable? (Hint: Increase? Decrease? Varied? Fluctuated? Stayed the same?)

Conclusion

The conclusion is a discussion of what the data, patterns, and relationships mean. The conclusion answers the original question. The conclusion consists of 5-6 sections.

The conclusion includes the following:

1. **Statement of support or non-support of the original hypothesis.**
   - DO NOT state whether the hypothesis was right or wrong.
   - State "The data collected did/did not/partially support the original hypothesis."
   - Include two or three sentences that **use specific numerical data to give evidence** of the support or lack of support for the hypothesis.
     - **Only use data that helps to answer the original question.**
     - Individual trials are normally not discussed.
     - DATA could include the MEAN (average), MEDIAN, MODE, RANGE, or PERCENT LOSS/GAIN!
     - Include units when discussing data.
2. **ANSWER THE ORIGINAL QUESTION.** What did you learn?
3. **Describe and discuss** any **unusual observations** made during the experiment.
   - An unusual observation is something that happens that was not expected.
   - Did it make you go "Hmmmm?"
4. Describe and discuss any **problems and/or solutions** that occurred during the experiment.
   - A problem differs from an unusual observation because a problem should be corrected if possible, and an usual observation does not need to be fixed.
5. **Describe ways that your investigation could be carried further or expanded.**
   - How could you elaborate on this topic?
   - What else could be done?
   - Increasing time and number or trials are NOT expansion ideas
   - HINT: Look at limitations to get expansion ideas
6. Write a **revised hypothesis** if the data did not support or partially supported the original hypothesis.
   - Written only if data did not support original hypothesis.
   - If a revised hypothesis is written, it does not replace the original hypothesis.

Key starter sentences/Bullet points ...

1. "The data collected [did/did not/partially] support(ed) the original hypothesis."
   - Numerical data (2nd and 3rd sentence) comparing the independent variables
   - 2-4 sentences
2. "These findings lead me to conclude...."
   - 2-4 sentences
3. "Unusual observations:"
   - Bullet points ONLY
   - If no unusual observations occurred, then write "None."
4. "Problem(s)/solutions(s):"
   - Bullet points ONLY
   - "Problem:"
     - "Solution:"
   - If no problems occurred, then write, "None."
5. "Expansion ideas:"
   - Bullet Points ONLY (List at least 2 ideas)
6. "Based on the data collected, my revised hypothesis is if..., then....."
   - ONE sentence only - follows the "If..., then...." format.

Application

- Elaborate on the purpose of this investigation.
  - Describe applications of the investigation.
  - Discuss the usefulness of the investigation.
- Describe how the results of the investigation could be helpful to another person.
  - Who would want to know about these results and why?
- Background knowledge?
- The application must be related to the data and conclusion.
- What can we do with this information?
- 5-8 sentences

Abstract

The abstract is a **brief overview (summary)** of the investigation written on a separate page.

- The abstract consists of **4 sections and a maximum of 250 words**. (Do a word count!)
- The abstract should not be more than one (1) page.
- The abstract should include the project title, a statement of the purpose, hypothesis, a brief description of the procedure, and the results.
- The abstract is written in **PAST** tense.

Key starter sentences for each of the paragraphs are ...

1. "The purpose of this project was ...." "I hypothesized that...."
   - Note: Do not include the second sentence of the purpose or hypothesis.
2. "The experiment involved... (Brief procedure of the experiment.)
3. "The data collected [did/did not] support the original hypothesis...." Step #1 of the conclusion
4. "These findings lead me to believe...." Step #2 of the conclusion – last sentence(s)

Abstract: **Begin numbering the pages of the report**

This is a brief overview of the project. It should not be more than one page and should include: project title, a purpose statement, the problem, a hypothesis, a *brief* description of the procedure, important observations, important data, the results, the conclusion, and real-world application(s).

Example:

1. Abstract

The purpose of this project was to find out whether or not a can of regular soda and diet soda would sink or float when placed in a tub of water at room temperature. The hypothesis was if a can of regular soda is placed in a tub of water, then it will sink while its diet counterpart will float. The experiment involved placing 4 cans of regular soda and their counterpartys into a bin of tap water. The water was left at room temperature and did not contain any solutes. Three trials were conducted. Data was recorded on a table based upon whether the can of soda sank or floated. Various types of soda were used, but final results were matched against similar sodas. For example, the Mountain Dew and Diet Mountain Dew data were compared for a more accurate depiction of cause of floating or sinking. Once the data was recorded, it was revealed that regular soda does indeed sink while its diet counterpart floated. The ingredients were compared and contrasted to attempt to find the cause for the different results. Research was also conducted to find the answer to why the diet soda floated while the regular soda sank. After much research and data analysis, a proper conclusion was made to explain the phenomena. The diet soda has a lower density than regular soda because of its sugar content. A solution with more solutes will be denser than water alone which explains why regular soda sank in water

(This should be double spaced)

Introduction:

Include a statement of your problem, hypothesis, and purpose. Also include a detailed description of your experiment. Include research information about the topic you are experimenting. Be sure to include quotes and citations from your research. State what information or knowledge you had that led you to hypothesize the answer to the project's problem question and why this topic interests you. Example:

2. Introduction

The purpose of this experiment is to determine whether regular soda or diet soda will sink or float when placed in a tub of water. Based on the research conducted, the hypothesis for this project is that if a can of regular soda is placed in a tub of water at room temperature, then it will sink while its diet counterpart will float.

In the following experiment four different types of 12 ounce aluminum cans of regular soda and their diet counterparts will be tested. The cans of soda will be placed in a tub of room temperature water. Observations will be made as to whether the cans sink or float. The data will be recorded. Three trials of this experiment will be conducted to assure accuracy of results. After the results are recorded, the ingredients of each type of soda will be compared.

Density is the amount of mass contained within a specific volume ("Density", pg. 1).

When an object has a higher density than water, it will sink, whereas an object that has a lower density than water will float (Ophardt, Pg. 3). Research has shown that when placing cans of soda into a tub of water, the cans of diet soda were usually less dense than water, so they float (Shakhashiri, pg. 1). Sweetener is much sweeter than sugar, but has less mass (Lewis, pg. 1). Due to the lower mass, the overall density of diet soda is less than that of regular soda as well as water (Spangler, pg. 3). In 12 ounces of regular soda, there are over 40 grams of sugar which contributes to the higher mass and makes the can sink in water (Lewis, pg. 2).

This topic is of interest because the amount of soda and diet soda consumed in the United States are very high. It is interesting that people will consume such large quantities of soda even though some sodas will float and some will sink. Experimenting why objects float or sink in water is a way to learn more about density and to further explore this topic. Even though some materials look heavier than water, its density may actually be less causing it to float in water..

(This should be double-spaced)

Experiments and Data:

Each project experiment should be listed in this section. Experiments should include the purpose of the experiment, followed first by a complete list of the materials used and the amount of each, then by the procedural steps numbered in outline form. Include all measurements and observations that you took during the experiment(s). Graphs, tables, and charts created from your data should be labeled and, if possible, colorful. Example:

3. Experiments and Data

Purpose

To determine if regular and diet soda floats or sinks when placed in water and what causes them to sink or float.

Materials

1 can of diet soda
1 can of regular soda
Medium to large bin
Water

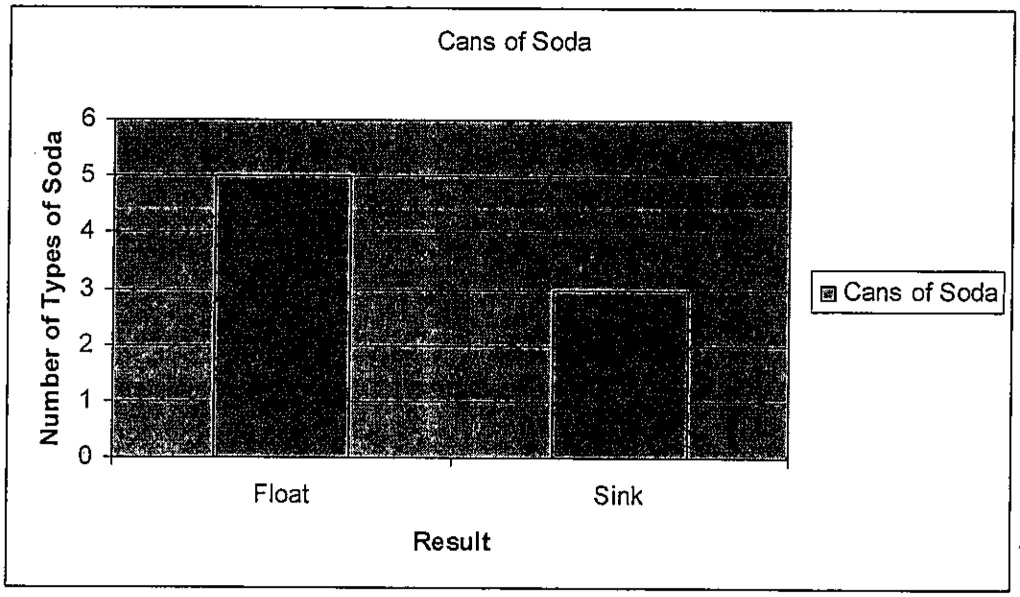
Procedure

1. Fill a bin with room-temperature water almost to the top.
2. Gently place the can of soda into the water.
3. Record if the soda floats or sinks.
4. Test various diet and regular sodas.
5. Record data on table.

Example Data Table:

Float (F) or Sink (S)						
Soda	Float: T1	T2	T3	Sink: T1	T2	T3
Mountain Dew				X	X	X
Diet Mountain Dew	X	X	X			
Coke				X	X	X
Diet Coke	X	X	X			
Root Beer				X	X	X
Diet Root Beer	X	X	X			
Fanta Orange	X	X	X			
Diet Fanta Orange	X	X	X			

Example Graph:



Conclusion:

This is a summary, in about one page or less, of what you discovered based on your experimental results. You need to state the hypothesis and indicate whether or not the data supports it. Include detailed descriptions of observations during the experimentation and data collection process. It should also include a brief description of topics you want to further. State what you would change if you were to do the experiment again. Example:

4. Conclusion

As stated in the hypothesis, if cans of regular soda are placed in a tub of water, then they will sink while their diet counterparts will float. The results of this experiment indicated that 3 out of the 4 regular cans of soda sank when placed in water and 4 out of 4 of the diet cans of soda floated when placed in water. The regular can of Orange Fanta floated. The ingredients of the cans of soda were then compared. All regular cans of soda except the Orange Fanta had 40mgs of sugar. Orange Fanta had 5mgs of sugar making its density less than that of water. All diet sodas contained 0mgs of sugar therefore making their density less than water and allowing them to float. Overall, the hypothesis was supported. Although an object may feel or look heavier than water, its density actually determines its ability to float or sink. Another aspect of this experiment that could be tested is changing the temperature of the water in the tub to hot or cold and then seeing if the cans of regular and diet soda will show the same results as when the water was at room temperature. If this experiment was to be conducted again, the cans of soda would be placed into the bin of water with the same force to ensure accurate results.

(This should be double spaced)

Works Cited/ Bibliography/References/ Sources: Centered on Top of last the Page

Cite all sources used for research. This includes the site or book you may have used to gain the information to perform the experiment. A useful website is www.citationmachine.net. Use the guide in the back of this packet to also help cite sources and for examples.

Works Cited

Lewis, Brian. "Livestrong.Com." Why Does Coke Sink and Diet Coke Float in Water? Anthem Blue Cross Blue Shield, August 11, 2011. Web. 28 Jul 2012. <http://www.livestrong.com/article/316876-why-does-coke-sink-diet-coke-float- in- water/>.

Ophardt, Charles. "Vitural Chembook." What is density. Elmhurst College, 2003. Web. 28 Jul 2012. <http://www.elmhurst.edu/~chm/vchembook/120Adensity.html >.

Shakhariki, Professor. "scifun.org." scifun.org. 01Jan2010. scifun.org, Web. 4 Jan 2010. <http://scifun.chem.wisc.edu/HOMEEXPTS/cans.htm>.

Spangler, Steve. "Steve Spangler Science." Sinking Soda Surprise. Steve Spangler Science, 2012. Web. 28 Jul 2012. <http://www.stevespanglerscience.com/experiment/sinking-*soda*>.

"Wikipedia." Density. Wikipedia, July 23, 2012. Web. 28 Jul2012<http://en.wikipedia.org/wiki/Density>.

Example Questions

1. Does the interaction between Mentos and different soda types (diet, regular, and clear) cause a change in the soda eruption height (meters)?
2. What is the effect of water temperature (30°C and 45°C) on bean seed germination (days)?
3. Do TCA 7th grade science students, with no late homework assignments, have a higher cumulative grade average than 7th graders with three or more late homework assignments?

Expectations - Question

€ Interrogative sentence
€ No spelling/grammatical errors
€ No pronouns/contractions
€ Testable experimental or engineering question; measureable data or rating scale
€ Variables (independent/dependent) clearly stated in question
    € IV: Parentheses used to show exactly what will be changed
    € DV: Parentheses used to show unit of measurement

Vocabulary Example

Carbonation: saturation with carbon dioxide, as in making soda water.

Chemical Reaction: the process by which elements and/or compounds interact with one another to form new substances.

Nucleation Site: a scratch on a surface, a speck of dust, or any place where you have a high surface area relative to volume.

Expectations - Purpose
€ No spelling/grammatical errors/contractions
€ Declarative sentence(s)
€ Do not use 1st/2nd person
€ One sentence restating the question in sentence form.
€ 2nd sentence **clearly** relating the question to a real-world issue
€ *HINT: Who would benefit from this information? Why is this investigation important? SAVE the WORLD!*
€ 3rd/4th sentence which elaborates and provides details for sentence 2

Purpose Example

The purpose of this investigation is to determine if the interaction between Mentos and different soda types (diet, regular, and clear) causes a change in the soda eruption height. This investigation is important for science teachers, since it is an inexpensive and fun experiment to demonstrate the following properties to students: chemical reaction, nucleation, scientific method, variables, and constants. This data will assist teachers in their instruction, captivate students due to the fun factor, and overall increase students' understanding of the scientific method.

Expectations- Variables/Constants/Operational Definition

- € No spelling/grammatical errors/contractions/personal pronouns
- € Independent, dependent, constants, control, operational definition labeled:
  - € Example

    Independent: _____(______, ______, ______)
    Dependent: _____ (units)
    Constants: _____; _____; _____
    Control: _____ (if applicable)
    Operational Definition: DV - _____ (bulleting OK)
- € Independent and dependent variables identified correctly
- € Constants listed and correct
- € Operational definition clearly defined and includes unit of measurement

Variables/Constants/Operational Definition Example

Independent: Soda type (diet, regular, clear)

Dependent: Soda eruption height (meters); remaining soda (mL)

Constants: weather conditions (wind direction, wind speed, barometric pressure); launching conditions (platform, bottle angle); soda temperature; Mentos (flavor, #); soda bottle shape; Mentos injector; soda manufacturing company; soda volume; time to unscrew cap; method of measuring soda eruption height; method of measuring remaining soda.

Control: Carbonated water

Operational Definitions:

1. Soda eruption height (meters):
   - Start at soda height inside two liter bottle.
   - Finish soda height at the highest eruption height of soda.
   - Position observers 25m from launch site.
   - Observers will count building's cinder blocks up to the highest eruption height of the soda.
   - Convert the cinder block measurement to meters.
2. Remaining soda (mL):
   - One minute after Mentos and soda reaction, measure remaining soda (mL) still inside two liter bottle.

Expectations - Hypothesis

- € No spelling/grammatical errors/contractions/personal pronouns
- € **Two to three** declarative sentences
- € Independent and dependent variables **clearly** reflected in the hypothesis
- € "If – then-" format evident
- € 2nd/3rd sentences: Hypothesis supported by research
  - € Explanation of the **evidence** used to form hypothesis

Hypothesis Example

If the soda type (diet, regular, and clear) is varied, then the soda eruption height will be the greatest for diet soda. Research indicates that when objects, such as ice, are placed in soda that additional foaming and carbon dioxide gases are released. Additionally, scientists speculate that it is the interaction between sugar-free additives (aspartame) and carbonated beverages that cause the greatest release of carbon dioxide.

Expectation - Materials
€ No spelling/grammatical errors/contractions/personal pronouns
€ Materials in list form
€ Quantity listed first for each item
€ ALL materials are listed
€ Only materials used for the actual experiment are listed.
€ Details included (brand/quantity)
€ Metric measurements

Materials Example

5 - Two liter soda (Coke)
5 - Two liter soda (Diet Coke)
5 - Two liter soda (Sprite)
5 - Two liter water (carbonated)
7 - Mentos Candy Rolls (mint flavor)
1 - Graduated cylinder (100 mL)
1 - Mentos releasing device (attaches to two liter bottle)
1 - Plastic bucket (20 L)
2 liters - Water (tap)
1 - Beaker (500 mL)
1 - 30 cm by 30 cm wood launching platform
1 - Stopwatch (seconds)
1 - Carpenter's level
1 - Paper towel roll
1 - Thermometer (°C)

Expectation - Procedure
€ No spelling/grammatical errors/contractions/personal pronouns
€ Imperative sentences
€ Design of experiment – well constructed test of hypothesis
€ Steps sequential
€ Steps detailed
€ Steps concise
€ Steps complete
€ Format followed
€ Numbered
€ Sentence begins with a verb
€ Number of trials
€ All materials are mentioned in procedure
€ Experiment easily repeated using directions
€ All safety considerations addressed; ensures little or no risk to student (Risk Assessment Form #3)

Procedure Example

1. Find a location for 30 cm by 30 cm launching platform.
2. Use the carpenter's level to ensure the launching platform is level and stable with no wobbles.
    - Launch the soda straight up into the air (perpendicular to the ground).
3. Ensure that the 3 observers that are measuring height, the 3 eruption timers, are ready with clipboards and pen/pencil.
    - Position observers 23 m from the launch site to determine the eruption height of the soda.
4. Unscrew the cap off of the Mentos Releasing Device (MRD).
5. Load seven peppermint Mentos into the MRD.
6. Reattach the cap to the MRD being careful not to accidentally pull launch cord.
7. Place the carbonated water in the center of the launch pad.
    - Ensure observers are ready.
    - Safety goggles must be worn by those that are attaching the Mentos Releasing Device (MRD) and releasing the pin.
8. Unscrew the soda cap and start the timer when the cap is off.
9. Screw the MRD onto the soda within 25 seconds of opening the bottle.
    - Make sure the MRD is tightly attached or soda will escape during launch.
    - Use caution when attaching MRD to carbonated water.
10. Initiate a 5 second countdown at 25 seconds.
    - 30 seconds from the opening of the soda to launch.
11. Release Mentos into the soda by pulling MRD launch cord.
12. Start timer to measure eruption time (seconds).
    - Eruption time starts when the Mentos touch the soda and ends when no "fizz" is coming out of the top of the soda bottle.
    - Record value in Table 3.
13. Measure the soda's eruption height:
    - Start at base of 2L soda bottle.

- Finish soda height at the highest eruption height of soda.
- Position observers 23m from launch site.
- Observers will count building's cinder blocks up to the highest eruption height of the soda.
- Convert the cinder block measurements to meters.
- Record value in Table 1.

14. Measure the remaining soda (mL) in the bottle one minute after the eruption.
    - Record value in Table 2.
15. Rinse (water) and dry (paper towels) the MRD.
    - Note: If any soda is left in the MRD, then this will start an early reaction and skew the data.
16. Repeat steps 3-13 four more times.
17. Repeat steps 3-15 using the following soda types:
    - Diet soda
    - Clear soda
    - Regular soda

Expectations - Data Analysis
€ No spelling/grammatical errors/contractions/personal pronouns
€ **Guidelines followed:**
€ Original question not discussed
€ Patterns or relationships between IV and DV explained/discussed
€ Limitations of data

Data Analysis Example

The general pattern of the data shows that the soda type (IV) did affect the soda eruption height (DV). As the soda type (IV) was varied, the soda explosion height (DV) appeared to increase for diet sodas when compared against the eruption height of regular sodas.

Limitations of the data:

- Soda type
- Mentos candy flavor
- Launching platform
- Mentos dispensing mechanism

Expectations - Table(s) and Graph(s)

- € Manipulate font sizes to enlarge and make the table/graph easy to read
- € Manipulate colors of font or cells of table/graph to coordinate with color theme of trifold
- € Table and graph are on separate pages (covers entire page)
  - € Flip charts can be used.
- € Computer program used to create table and graph
- € Printed in color
- € Table
  - € Title of table includes IV and DV (include units)
  - € Column headings correctly labeled
  - € Number of trials evident
  - € Mean, Median, Mode, Range, Random Error (What answers question)
  - € Borders
- € Graph
  - € Title of graph (IV/DV)
  - € Data graphed answers the original question
  - € Appropriate type of graph (line, bar/column, etc.)
  - € Y-axis labeled appropriately (dependent variable)
  - € X-axis labeled appropriately (independent variable)
  - € Key used if applicable
  - € Scale starts at 0; NO breaks in scale
  - € NO 3-D

Expectations - Conclusion

- € No spelling/grammatical errors/contractions
- € **Guidelines followed (see conclusion notes):**
  - € Relates directly to the support or non-support of hypothesis
  - € Supported by data; Specific data is used to support
  - € Individual trials are not discussed (unless relevant to answering original question)
  - € Answered original question
  - € Problems and solutions described (if applicable)
  - € Unusual observations described (if applicable)
  - € Expansion idea(s) indicated
  - € Revised hypothesis written - If… then…. (if applicable)

Conclusion Example

The data collected did support the original hypothesis. The average soda eruption height for diet soda was 7.32 meters compared against regular cola soda which was 4.57 meters, and clear soda which was 5.2 meters.

The soda type (independent variable) did affect the soda eruption height (dependent variable). As the independent variable was varied to a diet soda, the soda eruption height was higher than that for a regular soda. These findings lead me to conclude that diet drinks cause a higher soda eruption height than regular sodas.

Unusual Observation: How much the amount of foam varied between the types of soda

Problems/Solutions:

- Problem: When loading Mentos into the releasing device there was a small amount of soda in the chamber and the Mentos started reacting prematurely.
    - Solution: The Mentos releasing device was rinsed with plain water and dried before reloading.
- Problem: A PVC pipe was marked off in meters to determine the height, but was too wobbly to stand straight up.
    - Solution: The building had uniform brick measurements so the eruption height was determined by counting the number of bricks of the highest soda drop and then converting that into meters.

Expansion Ideas:

- Add different amounts of aspartame (the sugar additive used in diet sodas) to plain water
- Use orange and diet orange soda or cherry and diet cherry soda
- Use different temperatures of the same soda

Application Example

Investigating the soda eruption height of sodas when Mentos is added allows teachers to effectively explain the basics of chemical and physical reactions to their students. Additionally, teaching independent (IV) and dependent variables (DV) can be rather boring material to seventh graders; however, if the DV becomes an eight meter soda eruption, then students are captivated and learning is invigorated. If teachers have a working knowledge of what to expect and how to perform a Mentos/soda experiment, then they will be more likely to use this experiment in the classroom. Finally, this data would be important to the candy consumer in that he/she may want to adjust what soda is consumed when eating Mentos.

Last, but not least, setting up your display board

Now it's time to put all of your hard work together for display! Your project display will consist of a backboard, the project report, and anything that represents your project, such as models made, items studied, photographs, surveys, etc...

The backboard should be a tri-fold display. Boards should be no larger than 48 x 36 inches. All headings should be neat and large enough to read from a distance of 3 feet away. Lettering may be typed, stenciled, or you may use large pre-cut lettering. Your board must include the following:

1. Name
2. Title
3. Problem
4. Hypothesis
5. Procedure
6. Materials
7. Conclusions/Results
8. Data/Graph
9. Pictures
10. Neatness

* Project title should be at the top of the center panel. Data and graphs should be displayed below that.
* Problem, Hypothesis, and Procedure should neatly be placed along the left panel.
* Results, Conclusion, and possibly "Next Time" should be neatly placed along the right panel.
* Except for the title placement, you may vary from this exact format as long as all heading are displayed in an organized manner.

<u>Helpful Hints</u>

<u>DO</u>:

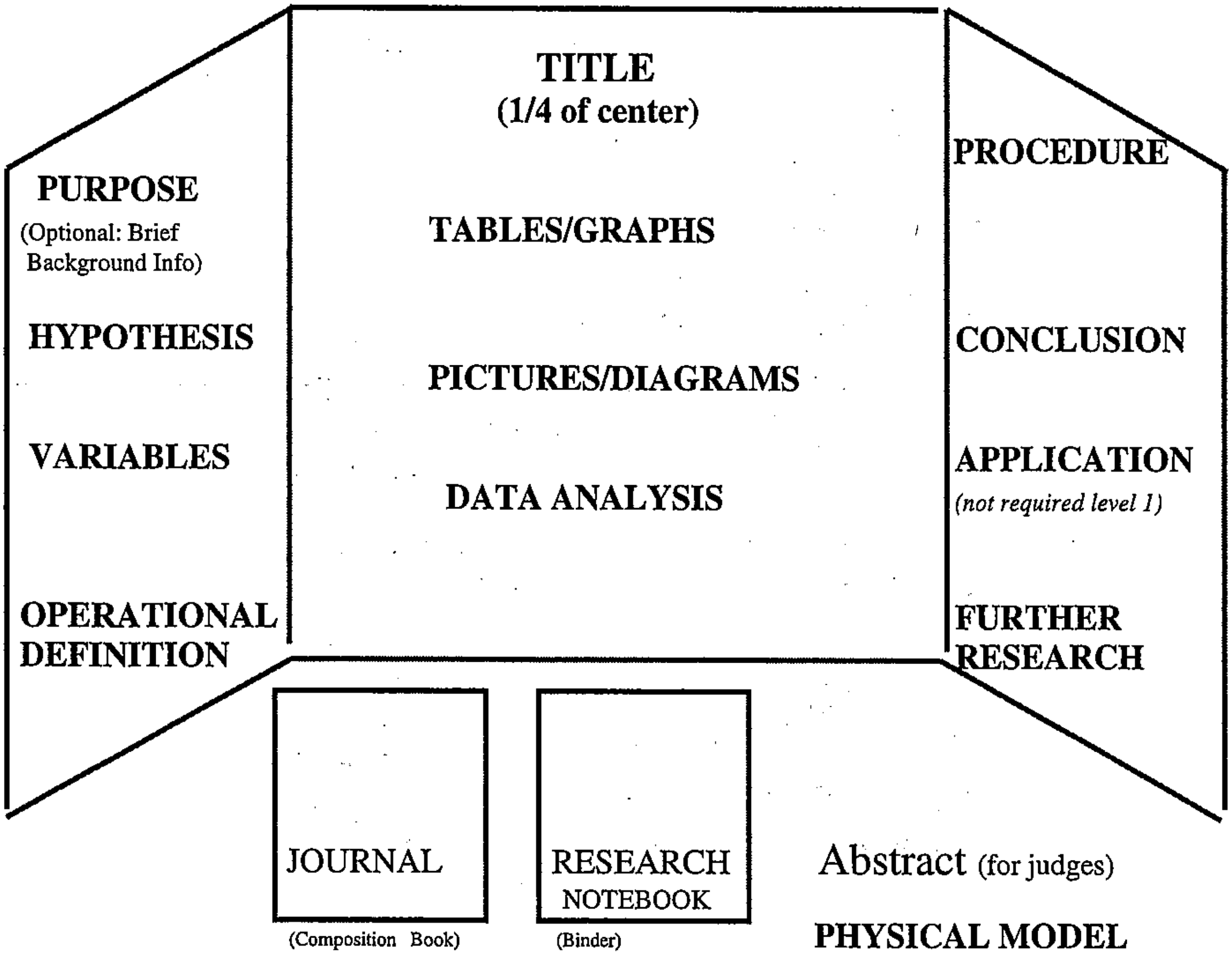
1. Use computer-generated graphs.
2. Limit the number of colors used and use contrasting colors.
3. Attach charts neatly.
4. Balance the arrangement of materials on the backboard,
5. Use rubber cement or double-sided tape to attach papers (white glue can cause wrinkles).

<u>DON'T</u>:

1. Leave empty spaces on the backboard.
2. Make title or headings hard to read by using uneven lettering, words with different colors, or disorganized placement of materials.
3. Hand-print the letters on the backboard.
4. Attach folders that fall open.
5. Make mistakes in spelling words or writing formulas.

*Don't forget to ask questions if you need help and have fun!**

PHYSICAL DISPLAY - Layout



Physical Display Information:

1. All projects must be displayed on a trifold containing summary information under **organized headings.**
   - Exception: The title does not have a subheading.
2. Place title at the top of the middle section (usually takes up about ¼ of the middle trifold section) or on a header board.
3. Make sure that all corrections have been made including spelling and grammar.
4. All information on the backboard should be clear and concise to allow the viewer to grasp the essence of the project quickly. Information should be presented in an organized and attractive manner.
5. All information displayed on the trifold **must be typed**. (Exception: Title)
   - Font style and size can vary, but should be consistent in the project.
   - Observers should be able to view it from a short distance without squinting.
   - All information is **single-spaced.**
6. Choose a color theme (2-3 color preferred).
7. **All** text should be framed, including the subheadings. Framing can be computer generated.
8. All graphs and tables **should** be done on a computer using a computer-graphing program.
   - Create a citation that reads: "Table(s) and graph(s) created by (your name)."
     - If a table or graph is used from another source, this must be cited.
9. ALL pictures must be cited unless clipart:
   - "Photograph taken by ..." or "Image acquired from..." If all pictures were taken by the same person, one citation can be used.
   - Be aware of copyrighted pictures.
10. Before gluing any paper on the trifold, place each item where you think it should go and adjust.
    - This will allow you to adjust spacing/crowding.
    - Glue sticks, rubber cement, or double-sided tape work best. No tape should be visible when viewing the trifold. Do not use Elmer's glue or scotch tape.

BLRA Science Fair Rules and Regulations

All exhibits must conform to the following rules and regulations. These rules and regulations should be considered as your project is developed.

Use of Live Animals:

The use of animals during experimentation is prohibited. You may not experiment with or harm live animals in any way.

Health and Safety:

1. Microbial cultures or fungi, living or dead, must be carefully covered and sealed tightly at all times.
2. Animal or human parts, except for teeth, hair, nails, and dried animal bones may not be displayed.
3. No running water or liquids may be displayed.
4. Chemicals and/or their empty containers, including caustics, acids, and household cleaners may not be displayed.
5. No lighting is permitted on displays.
6. No open or concealed flames permitted.
7. No use of batteries with open-top cells.
8. Combustible materials may not be displayed.
9. No aerosol cans of household solvents.
10. No use of controlled substances, poisons, or drugs.
11. Any equipment or device that would be hazardous to the public may not be used.
12. Sharp items, such as syringes, knives, and needles may not be used.

Abstract Template

Name: ______________________________________

Title of Project: ____

1. ***Purpose of project/experiment***
    - Write an introductory statement of the reason for investigating the topic of this project
    - Write a statement of the problem and hypothesis being studied

2. ***Summarize procedures, emphasizing the key points or steps***
    - Summarize the key points and an overview of how the investigation was conducted (*Do **NOT** include materials*)

3. ***Detail observations, data, results***
    - Provide all results that lead you to your conclusion (answer to the question/problem)
    - Do not include too many details
    - No graphs or charts

4. ***State conclusions or applications***

INTRODUCTION TEMPLATE

<u>Paragraph 1:</u> *General Information*

- Problem

- Hypothesis

- Purpose

<u>Paragraph 2:</u> *Description of your project*

- What are you going to do?

- Where are you going to do the experiment?

- How are you going to do the experiment?

- What do you expect the outcome to be?

Paragraph 3: *Description of the research topics (Ex: light and plant, conductivity of metals)*
This entire paragraph is citations from your research

Paragraph 4: *Experiment/topic appeal*

- Why does this topic interest you?

- What do you hope to learn from this experiment?

Conclusion Template

Include the following in your conclusion:

1. If experiment supported and did not support your hypothesis.

2. Detailed description of your observations during the experiment/data collection.

3. Describe what topics or experiments you would need/want to explore further based upon the finding of your experiment.

4. If you did the experiment again, what would you change?

SUGGESTED BIBLIOGRAPHY
GUIDE TO PREPARING BIBLIOGRAPHY / WORKS CITED

When doing research and writing a report, it is always necessary to name the source(s) of your information. This list of sources is called a **bibliography / works cited**. A bibliography should be listed alphabetically. The second line of an entry should be indented. Skip a line after each entry.

FOR A BOOK:
Author's last name, first name. Title of book. Place of publication: Publisher, copyright year.
example:

Fogle, Bruce. Training Your Dog. New York: DK Publishing, 2001.

If you only used part of a book:
Fogle, Bruce. Training Your Dog. New York: DK Publishing, 2001, pp. 50-55.

FOR AN ENCYCLOPEDIA ARTICLE THAT IS SIGNED:
Article author's last name, first name. "Title of article." Name of encyclopedia. Copyright year. Volume number, page(s).
example:
Clark, William W. "Gothic Art." World Book Encyclopedia. 2002.
Volume 8, pp. 277-278.

FOR AN ENCYCLOPEDIA ARTICLE THAT ISN'T SIGNED:
"Title of article." Name of encyclopedia. Copyright year. Volume number, page(s).
example:
"Golden Retriever." World Book Encyclopedia. 1999. Volume 8, p.255.

FOR A MAGAZINE OR NEWSPAPER ARTICLE:
Article author's last name, first name. "Title or headline of article." Name of magazine or newspaper. Date of magazine or newspaper, page(s).
example:
McGill, Kristy. "A Baltic Scramble." Faces. May, 2003, p. 27.

FOR AN INTERNET ADDRESS:
Author's last name, first name. "Title of item." [Online] Available
http://address/filename, date of document or download.
example:

DiStefano, Vince. "Guidelines for Better Writing." [Online] Available
http://www.usa.net/~vinced/home/better-writing.html, October 5, 2002.

This example of how to cite an INTERNET source was downloaded from this online source.

FOR AUDIOVISUAL MATERIALS:
Title of material. Type of material. Place of publication: Publisher, copyright date.
example:
Bizet's Dream. Videotape. New York: Sony Wonder, 1998.

FOR A CD-ROM:
"Article title." CD-ROM title. CD-ROM. Copyright date.
example:
"Titanic Disaster." Encarta 99 Encyclopedia. CD-ROM. 1999.

FOR AN INTERVIEW:
Name of person interviewed (last name first). Kind of interview. Date.
example:
Watson, Cosmo. Personal interview. July 29, 2003.

Your finished bibliography should be alphabetized by the first word of the entry, and will look something like this:

BIBLIOGRAPHY/WORKS CITED

Bizet's Dream. Videotape. New York: Sony Wonder, 1998.

Clark, William W. "Gothic Art." World Book Encyclopedia. 2002. Volume 8, pp. 284-286.

DiStefano, Vince. "Guidelines for Better Writing." [Online] Available http://www.usa.net/~vinced/home/better-writing.html, October 5, 2002.

Fogle, Bruce. Training Your Dog. New York: DK Publishing, 2001, pp. 50-55.

"Golden Retriever." World Book Encyclopedia. 1999. Volume 8, p.255.

McGill, Kristy. "A Baltic Scramble." Faces. May, 2003, p. 27.

"Titanic Disaster." Encarta 99 Encyclopedia. CD-ROM. 1999.

Watson, Cosmo. Personal interview. July 29, 2003.

In-text Citations: Used in the background information in your introduction

In your writing, use a quote to flow with the rest of your sentence. To insert an in-text quote use the following format: write a part of your sentence, comma, quotation mark, write the copied text, close with quotation marks, parenthesis, the author's last name, comma, page number, end parenthesis, followed by a period.

Research states that, "Cans of diet soda are usually less dense than water, so they float" (Shakhashiri, pg 1).

SUGGESTIONS FOR AN ORAL PRESENTATION

1. Smile and be polite.
2. Wear nice clothes and have a neat appearance.
3. Stand straight and still. Clasp your hands in front or behind you.
4. Pay attention to the audience and keep eye contact.
5. Project your voice so the audience can hear you.
6. Stand on the right side of the trifold (if facing the audience).
7. Point out tables, graphs or other interesting features of your project.
8. Show enthusiasm in your work.
9. DO NOT point out mistakes!
10. Practice in front of a mirror, parents, friends, and grandparents.
11. Present in an organized manner mirroring the order on the trifold.
12. Use your trifold as a big note card. **Do not read the board!**
13. **You are the expert!** Present with confidence!

ORAL PRESENTATION OUTLINE

1. Introduce yourself.
2. Give the purpose of the project.
3. Create an interesting introduction using one of the following suggestions:
   - Briefly explain why you became interested in this particular project.
   - Begin your speech with a startling or interesting fact.
   - Begin with general background information about the topic.
4. Tell what you hypothesized and why. Include the independent variable and dependent variable as part of this discussion. Support hypothesis with background information.
5. Explain your procedure. Share any problems you had with the investigation and how you solved the problems.
6. Discuss the number of trials, and show the results using the journal, charts, and graphs.
7. Explain data analysis: precision, limitations, and statistical differences.
8. Discuss your conclusions using the data to support the conclusion. Explain how the data supports or does not support (refutes) the hypothesis. If there were problems or errors in the experiment, relate these and their bearings on the outcome.
9. Tell what further experiments could be done and what you would do differently if you were to do this experiment again.
10. Explain any applications of your study.

Judging *Adapted from the Intel ISEF 2009-2010*

Judges evaluate and focus on 1) what the student did in the current year; 2) how well a student followed the scientific, engineering, computer programming or mathematical methodologies; 3) the detail and accuracy of research as documented in the data book; and 4) whether experimental procedures were used in the best possible way.

Judges look for well thought-out research. They look at how significant your project is in its field; how thorough you were, and how much of the experiment thought and design is your own work. Judges applaud those students who can speak freely and confidently about their work. They are not interested in memorized speeches or presentations – they simply want to **talk** with you about your research to see if you have a good grasp of your project from start to finish.

It is important to start the interview off right. Greet the judges and introduce yourself. You want to make a good first impression. Appearance, good manners, appropriate attire, and enthusiasm for what you are doing will impress the judges. Judges often ask questions to test your insight into your projects such as: "How did you come up with this idea? "What was your role?", "What didn't you do?", "What further plans do you have to continue research?" and "What are the practical applications of your project?"

Remember that the judges need to see if you understand the basic principles of science behind your project or topic area. They want to determine if you have correctly measured and analyzed the data. They want to know if you can determine possible sources of error in your project and how you might apply your findings to the 'real' world. Finally, the judges seek to encourage you in your scientific efforts and your future goals/career in science. Relax, smile and enjoy your time to learn from them and accept their accolades for your fine work.

BLRA Science Fair Judging Rubric

Student Name/Grade: ______________________________

Judging Rubric	**Project Title:**			**Total Points:**	
Part I Scientific Procedure:	EXCELLENT	ABOVE AVERAGE	ADEQUATE	MINIMAL	UNSATISFACTORY
Clear & specific Question	4	3	2	1	0
Question is testable	4	3	2	1	0
Clear & specific Hypothesis	4	3	2	1	0
Complete & thorough Procedure (Step by step)	4	3	2	1	0
Complete & thorough Data (logs, graphs, tables, photos...)	4	3	2	1	0
Conclusion supported by Data and is relevant to Hypothesis	4	3	2	1	0
Part II Originality:					
Original topic or approach	4	3	2	1	0
Part III Presentation:					
Display easy to read; well-organized; color and graphics add to display	4	3	2	1	0
Clarity of overall project	4	3	2	1	0

1. **Clear and specific question:**

4 The title clearly states both the independent and dependent variables and is written as a clear declarative statement.
3 The title is clearly connected to the investigation and mentions as least one of the variables.
2 The title is clearly connected to the investigation, but does not mention the dependent or independent variables.
1 The title is present but not does relate directly to the investigation.
0 Not attempted

2. **Question is testable:**

4 The question that the investigation was designed to answer is well articulated and testable.
3 The question that the investigation was designed to answer is testable.
2 The question that the investigation was designed to answer is somewhat testable.
1 The question is present, but is not testable.
0 Not attempted

3. **Clear and specific hypothesis:**

4 The prediction is clearly stated and shows a reasonable relationship between the independent variable on the dependent variable.
3 The prediction is stated, but only mentions one of the variables.
2 The prediction is stated but is not reasonable.
1 The prediction is present but does not show a relationship between the variables.
0 Not attempted

4. **Complete & thorough procedure:**

4 A detailed, logical step by step procedure is listed.
3 A logical step by step procedure is listed, but a few steps are missing or incomplete.
2 A logical step by step procedure is listed, but some steps are missing or incomplete.
1 A logical step by step procedure is listed, but many steps are missing or incomplete.
0 Not attempted

5. **Complete & thorough data:**

4 Data table(s), graph(s), and other representations of data are accurate, easily understood and complete including title, appropriate labels, appropriate placement of variables, and use of correct units of measurement.
3 Data table(s), graph(s), and other representation of data include most of the above components.
2 Data table(s), graph(s), and other representations of data include some of the above components.
1 Data table(s), graph(s), and other representations of data include few of the above components.
0 Not attempted

6. **Conclusion supported by data and relevant to hypothesis:**

4 Conclusion clearly restates the question and whether the prediction was supported with evidence; includes an explanation that effectively connects results to scientific knowledge; and, also provides suggestions for further investigations.
3 Most parts of conclusion are complete and accurate.
2 Some parts of conclusion are complete and accurate.
1 Few parts of conclusion are complete and accurate.
0 Not attempted

7. **Original Topic:**

4 Project idea displays creative thought and originality. Stands out in the crowd.
3 Project idea displays some originality and creativity.
2 Project idea displays little originality and creativity.
1 Project idea is overdone and clearly came from a book.
(Do not give a zero on this, as they all came up with something!)

8. **Display easy to read, etc...**

4 Display is easy to read. Display is well-organized. Color, graphics, and other visual components add to the display.
3 Two out of the three qualities listed above are present.
2 One out of the three qualities listed above is present.
1 One out of the three qualities listed above is poorly presented.
0 Display is difficult to read, poorly organized, and visual components such as graphics or color are missing or distracting.

9. **Clarity of overall project:**

4 Effective communication of scientific concepts, design principles, data analysis and further studies.
3 Three out of the four qualities listed above are present.
2 Two out of the four qualities listed above is present.
1 One out of the four qualities listed above is present.
0 Communication was not effective.

Science Fair Report Grading Criteria

Name: ______________________________ Experiment: ________________________

Overall Document Formatting.. _________/10 points

- Double Spaced (1)
- 12 font (1)
- Times New Roman or Arial font (1)
- Pages Numbered with Last Name (1)
- 1 Inch Margins (1)
- Typed (1)
- Little to no spelling/grammar errors (4)

Title Page... _________/5 points

- Centered Vertically (1)
- Centered Horizontally (1)
- Capitalize the Title (1)
- Name, Class, Section, Date (2)

Table of Contents.. _________/5 points

- "Table of Contents" bolded and centered (1)
- Items numbered (1)
- Includes Abstract, Introduction, Experiment and Data, Conclusion, and Sources (2)
- Identify correct page numbers (2)

Abstract.. _________/20 points

- "1. Abstract" bolded and left justified (1)
- Problem and hypothesis identified (2)
- Purpose of experiment (2)
- Summarized procedures (5)
- Detailed observations, data, and results (6)
- Conclusion/results stated (2)
- Real-World Application (2)

Introduction .... _________/25 points

- "2. Introduction" bolded and left justified (1)
- At least 4 paragraphs (1)
- Problem, Hypothesis, and Purpose stated (5)
- Description of experiment and procedures (10)
- Information from research on topic including quotes and citations (6)
- Explanation on why this topic was chosen (2)

Experiment and Data... _________/15 points

- "3. Experiment and Data" bolded and left justified (1)
- Includes Purpose, Materials, Procedure, Data Table, Graph subheadings (2)
- Purpose statement (1)
- Detailed list of materials (including quantities needed) (2)
- Detailed procedures listed (5)
- Accurate data table (2)
- Accurate graph (2)

Conclusion... ________/15 points

- "4. Conclusion" bolded and left justified (1)
- Evidence that hypothesis was proven correct or incorrect (3)
- Detailed observations from experiment (8)
- Description of other questions that arose due to experiment results (1)
- What would be changed if experiment was repeated (2)

Works Cited... ________/5 points

- "Works Cited" centered and bolded (1)
- Sources are in correct format (3)
- Sources are alphabetized by author last name (1)

Total Points __________________________ / 100 points __________________ %

A B C D F

Comments:

Display Board

- Name
- Title
- Problem
- Hypothesis
- Procedure
- Materials
- Conclusion/Results
- Data/Graphs
- Pictures
- Neatness

________ / 40 = __________ %

A B C D F