SIRS: Successful Independent Research in Science
Collins Hill High School

The scientific research process is the essence of science. At CHHS, all students have the opportunity to conduct an independent science research project. Students may choose to research the same area for three or four years, or may vary their topic as their expertise and interests change. Each year the student will develop more extensive research skills. Students are encouraged to wonder, question, and explore about a topic that they are PASSIONATE about. Students will have a chance to enter their research in the Science/Engineering Fair, Georgia Junior Science and Humanities Symposium, and other National Competitions.

The following packet explains the research process in its entirety, including expectations, formatting, rubrics, examples, and deadlines. Knowing details about the final product should help direct you. Carefully review this entire packet. In addition, review the following website for all forms you will have to complete prior to collecting data.

Go to: **www.uga.edu/oasp. (forms, rules, regulations, and guidelines)**

Final Product Overview

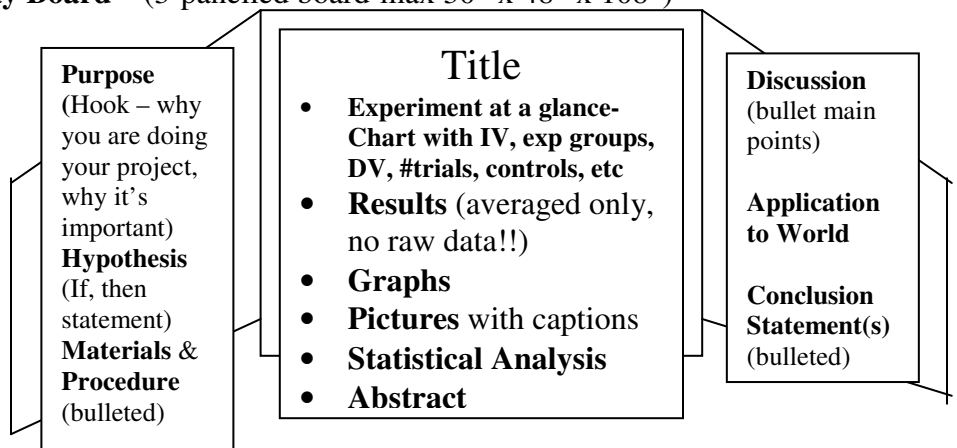
Log Book – (Bound composition book with graph paper)

- Title page
- Acknowledgements
- Table of contents
- Bibliography cards
- Research Question
- Research cards
- Materials & procedures (label independent, dependent, and controlled variables; experimental groups; control group; hypothesis)
- Data tables with titles and units
- Results including averages, calculations, statistical analysis, narrative captions
- Discussion (bullet main points)
- Conclusion (paragraph)
- Journal (15 pages from end)

Project Notebook – (3-ring binder with pocket and 3 dividers)

- Front Cover and spine with project title, student, mentor, school name
- Before Divider:
  - Title page
  - Table of contents
- Divider 1/Abstract:
  - Abstract
- Divider 2/Forms:
  - Form 1
  - Form 1A with Research Plan Attachment
  - Form 1B
  - Additional Forms, Surveys, etc…
- Divider 3/Research Paper:
  - Rationale (Introduction)
  - Materials and Procedures
  - Results (Data Tables with averages only, calculations, graphs, statistical analysis, narrative captions)
  - Discussion (paragraph form, heart of paper, min. of 2 pages)
  - Conclusion (paragraph)
  - Acknowledgements
  - Bibliography
  - Appendix (copy of survey/test, diagram of specialized equipment, etc…)

Display Board – (3-panelled board-max 30" x 48" x 108")



* Put your name, mentor name & CHHS on top back middle panel

www.uga[illegible]view rules, regulations, and guidelines.

1. Setting up Log Book (1st week of school)
Purchase bound notebook with graph paper to be used exclusively for science project. (Graph paper bound notebooks available at school store.) Set up title page (leave title blank for now), acknowledgement page, table of contents, bibliography card section, and background research card section. (See end of packet.) **Remember that all entries in log book must be in permanent blue or black ink with no white out or taped in pages. Each entry must be dated.** Number fronts of pages beginning with bibliography card section in upper right hand corner of page and continue through all the pages in the book. Count 15 pages from the back of the book and label "Journal". A journal is a diary of your scientific thoughts as you proceed through the project. Each entry should be dated and initialed. Keep table of contents and journal up to date as you work on project.

How to Set Up Log Book

Title Page
(1st page in log book-unnumbered)

Title

Name
Course
Mentor's Name

Acknowledgements
(2nd page in log book-unnumbered)

Acknowledgements

- Name, reason
- Name, reason

Table of Contents
(front of 3rd page-unumbered)

Table of Contents

Heading	Page Number(s)
Bibliography Cards	
Research	
Materials and Procedures	
Data Tables	
Results	
Discussion	
Conclusion	
Journal	

www.uga.edu/oasp. Review rules, regulations, and guidelines.

Bibliography Cards

Draw 4 bibliography card pages (see below). Number pages in upper right hand corner 1-4. Do not write on back of pages.

Bibliography Cards 1	
Use MLA Format I	Use MLA Format II
Use MLA Format III	Use MLA Format IV

Research

Begin research section on "page 5". Divide research pages in ¼'s just like bibliography cards. Use front and back of pages, but just number front of pages. (So back of 5 will not have a number. Next front page, numbered "6".) Because of the source numbers, you do not have to take all the notes from one source consecutively. (Don't forget to update page numbers in the table of contents after you have completed all notes.)

Research Notes – Research Question 5	
Topic word Source # 1 general idea or fact page #	

www.uga.edu/oasp. Review rules, regulations, and guidelines.

2. Checking your computer for printability of UGA forms (1st week of school) – Go to UGA website (www.uga.edu/oasp) and try to type your name on Form 1, print a copy with your name typed on it).

3. Topic Selection – The CRITICAL Part of the whole process (August)
Identify area(s) of interest. Remember this is one of the few times you get to direct your own learning. What are you passionate about? What do you wonder about? Select an area you are truly interested in. Learn what you want to learn about rather than just what someone else decides you need to learn about. Now read 20 + articles on your area of interest (go to library, search data bases on the internet, talk to professionals in the field, write to companies for information, etc).

One of the best places to find good research articles is **Galileo**:
Go to www.galileo.usg.edu and log in with password for this quarter--"_____" (ask teacher).
You should get a Galileo screen that says "Welcome Gwinnett County Schools user." Click "Science & Technology" tab. Select "Academic Search Premier at EBSCO host (under all sciences). You will get a green, yellow, and blue screen. This is where you want to search from. (You *may* want to limit your search to □ full text articles and □ scholarly (peer reviewed) journals.)

You can also go to www.collinshill.org and find the Media Center Box on the right. Click "home page" then "resources" then "GCPS Media Research Services Homepage". Click on "Science" button on the left, then on Science Resource Center. The **username** for home access is **Lawr16325** and the **password** is **Lawr16325.** This lists topics by type of science and is good if you have no idea where to start.

Here are some other great websites that may aid you in your research:

http://cris.csrees.usda.gov/	USDA website for ongoing and current research in agriculture, food, and nutrition (there is a USDA lab in Athens-mentor or lab opportunity?!)
www.sciencenews.org	summary articles of current research-GREAT SITE!
http://www.uga.edu/oasp/gsef/gsef/sources.html	science fair topic list
http://www.scout.cs.wisc.edu/Reports/ScoutReport/Current	mixture of new articles
http://www.scicentral.com/	mixture of new articles
http://www.newscientist.com/news.ns	mixture of new articles
http://www.sciencedaily.com/	mixture of new articles
http://www.biochemj.org/	biochemistry journal
http://www.amjbot.org/	American Journal of Botany
http://jcst.ict.ac.cn/	Journal of Computer Science and Technology
http://www.terrapub.co.jp/journals/EPS/	Earth, Planets and Space
http://www.imuj.indiana.edu/	Indiana University Mathematics Journal
http://jpubhealth.oxfordjournals.org/	Journal of Public Health
http://aem.asm.org/	Applied and Environmental Microbiology
http://apl.aip.org/	Applied Physics Letters
http://www.iop.org/EJ/njp	New Journal of Physics
http://pubs.nrc-cnrc.gc.ca/cgi-bin/rp/rp2_desc_e?cjz	Canadian Journal of Zoology
http://www.sciencemag.rog/	Science Magazine

Look for research to base a problem on. Jot down possible ideas. Think about the feasibility of your idea(s), the originality of the idea. Is there one relationship that you could investigate and can you measure the variables? Complete **"SIRS Research Project Approval Form" -** this form must be approved by the SIRS committee prior to continuing project.

Things to consider:

1. Science Fair Categories: Behavioral/Social/Gerontology, Biochemistry, Botany, Chemistry, Computer Science, Earth/Space Science, Engineering, Environmental Science, Mathematics, Medicine & Health, Microbiology, Physics, Zoology
2. Go to www.uga.edu/oasp to check out past successful projects, get ideas, and to get current information about this year's science fair.
3. You will study this topic extensively so choose something you are passionate about.
4. You may work individually or in a team of 2 people. Team projects do not have as much chance at competitions. If you have a busy schedule, you will probably have trouble completing a team project as it is often difficult to coordinate schedules.
5. Projects involving humans, animals, pathogens, controlled substances, recombinant DNA, tissue, or hazardous chemicals, radiation, etc… must have prior approval and must complete extensive forms – go to www.uga.edu/oasp.
6. Notes about the different categories:
    a. Behavioral (at least 100 people, signed forms by parents of all 100 people who are under 18)- behavior projects do not typically compete well. Very frustrating to find people who can be tested when you need them to. Must have prior approval from IRB committee.
    b. Microbiology – can only be done at CHHS in some cases. Usually must find a microbiology lab to work in.
    c. Chemicals – must be done at CHHS or in a lab setting.
    d. Plants – Must use a minimum of 100 total with 50 per group. Must measure at least 5 growth factors (height, mass, color, thickness, diameter, etc…)
    e. Vertebrates – direct supervision of a vet; if use fish, must use at least 30; consider using nonvertebrates – worms, insects, daphnia
    f. Engineering projects focus on designing, building, testing, and redesigning/retesting a prototype. Instead of a hypothesis, you will have an engineering goal.
7. Generally, avoid science fair project idea books – usually they are too simplistic
8. No product comparisons.
9. Example of how to use an article to find a question to investigate: The following article appeared in the Summer 2001 Scientific American Explorations. A student who was passionate about cars found this article:

Compost: Imagine an auto junkyard with… no cars? It could happen if researchers at the University of Warwick in England are successful. The scientists are working with farmers to use elephant grass (Miscanthus) to produce biodegradable car parts. The hardy, high-yield perennial grass reaches 10 feet tall. It is already farmed for animal bedding and roof thatching. Now short lengths of elephant grass may be used to strengthen plastics for use in car parts such as wheel trim. Don't worry – the parts will not decompose while you're driving but can be composted at the end of vehicle's life.

When you find an article you are interested in, you can get an idea directly from the article, modify an idea in the article, do a similar but different experiment than the article did, etc… Suggest a project idea from this article.

10. Your topic question should reflect thought processes not capable of a middle school student. In addition, if the answer to your question is known, then there is no point in doing the experiment. Here is an example of how a project can progress through a student's high school years. The student chose to explore how different environmental conditions affected the rate of oxidation (ripening) of fruit in 9th grade. In the 10th grade year, the student chose to explore how the presence of root stimulator in beach grasses aided in erosion prevention. When brainstorming about an 11th grade project, the student realized that in both previous projects, gibberellic acid, a growth hormone, was actually involved in each process. After reading several related articles, an experiment was designed to explore whether environmental conditions could trigger the secretion or production of growth

hormones such as gibberellic acid. The student was also more aware of analytical tools available such as HPLC and had the people skills to set up experimentation in a university lab setting.

When your **SIRS Research Project Approval Form** has been approved, write your first Journal entry discussing scientific thought processes that you went through to find your topic.

4. Background Research (September)

Collect information from **at least 5 different sources besides encyclopedias** (5 different sources ***per person*** if team project). At least 2 of the sources must be science journal (magazine) articles. Research takes lots of time and patience. Get excited, follow up on interesting details, you never know where it may lead. Budget your time accordingly so you can savor any interesting tidbits you may run across.

As soon as you find a source you want to take notes on, complete bibliography card, **using MLA Format** (go to www.collinshill.org → for students→ MLA Guidelines), in Bibliography Card section of log book. Give each card a reference number, which you will use when you take notes from the source. Organize research so it's clear what the fact relates to and what source the fact came from. You may choose to divide your pages into sections to simulate note cards (divide in half or in fourths). Include topic word, source number, one idea/ fact, page number(s) info came from.

Become an expert on your topic. Research background info, results of other experiments done on your topic, detailed information on procedures, how to build/ use needed equipment, how to mix needed solutions if applicable, etc. Once your research is complete, you should be able to design, carry out, analyze the significance of your data, and understand the relevance of your project from the information you have collected. As you collect information on your project, make sure you can address all these points. **Do not just find general information on your topic. Information must allow you to better understand and evaluate your specific problem. Often research related to your topic has been done** (for example, instead of varying humidity, a previous study might have varied temperature on the velocity of volleyballs). **In addition, procedures for measuring variables may be discussed in previous articles** (for example, the ballistic pendulum for measuring velocity of volleyballs in the paper below). **Take note of this, you will refer to this in your paper. Here is an example of how previous research is extremely important in writing your Rationale (notice the Italics):**

Introduction/Rationale (sample)

The serve in volleyball is one of the most important aspects of the game. There are many different types of volleyball serves, all of which have a slightly different serving technique. For example, a float serve uses no special wrist flicking; instead, the wrist needs to be stationary when contacting the ball to prevent it from spinning (Trbovich, 2). The purpose of this experiment is to investigate which of the following volleyball serves, the float serve, top spin serve, or side spin serve, generates the highest ball velocity. To measure the velocity of a served volleyball, a ballistic pendulum can be used (Shabazi-Moghaddam, 231).

The float serve is one of the most commonly seen serves in professional beach and court volleyball games. This is because when playing outdoors a wind current can affect the ball movement causing it to drift from side to side or drop suddenly which makes it very difficult to return. This also happens in court volleyball, but it is not as dramatic (Alzina, 48). *In an experiment performed by Trbovich, Gosling and Clement, it was determined that the ball velocity of a float serve was 15.0 meters per second. The speed of a float serve should be at least 17 meters per second in order to create the drifting from side to side motion- or the sudden drop (Trbovich, 3).* The float serve can …

Then in the discussion section of your paper, you will again relate your actual data with similar studies and evaluate it. YOU MUST FIND SIMILAR RESEARCH TO COMPARE YOUR DATA WITH!

Discussion (sample)

… When the three average velocities are compared to Trbovich's results they are significantly lower. For example, in Trbovich's experiment the float serve had a recorded velocity of 15.0 m/sec. In this experiment the float serve had an average of 5.18 m/sec. The results indicate that the data recorded in this experiment is about 10.0 meters per second slower than Trbovich's. The ball velocity of the side spin and top spin serves both showed numerical differences similar to that of the float serve in Trbovich's experiment. In Trbovich's experiment the ball velocity is much higher than measured in this lab experiment. Another variable considered is that this experiment was performed by 15 year-old high school volleyball players while Trbovich's study did not indicate the skill level of the participants. A similar experiment by Morteza showed the ball velocity again much higher than that was calculated in this project. Morteza compared the serving ball velocity of Olympic, collegiate and beginner players. The velocity she recorded consisted …

Many factors may have contributed to the differences in the ball velocity results such as, the formula used to calculate the velocity, the design of the pendulum, or the process used to measure the height of the pendulum swing (student continues to prove with specific examples why her data differed from the published reports).

Complete your bibliography cards and research (in lab book). You need at least 5 nonencyclopedic bibliography cards in correct MLA style (2 must be science journals) and 50 research cards. At this time your mentor will also check to see you have title page, acknowledgement page, a table of contents page, and your 1st journal entry in your log book. See attached checklists.

5. Experimental Design/Forms (September)

The next step is to complete all science fair project forms. **Type information directly on forms and print forms from UGA web site. Complete:**

- Checklist for Adult Sponsor/ Safety Assessment (Form 1)- 1 per project. If team project, enter all students' names on the line that says "Student's name". Adult sponsor is your teacher.
- Either individual or team Research Plan 1A. **Note Research Plan 1A requires that you attach a separate typed (or computer printout) research plan** (see step 9 of form). When designing your experiment, remember to test only 1 variable (independent variable) and you must have a dependent variable that can be measured (preferably quantitatively). You must also have multiple trials. Please note that your bibliography must be in MLA style.
- Form 1B **per student (Note: need parent signature and date)**
- Other required forms as related to the project – check web site – below is guide only.
  Research Lab Work Site (other than school): Form 1C/2
  Human Subjects (Prior IRB Approval): Form 4
  Pathogenic Agents/Controlled Substances (Prior SRC Approval): Form 2 or 3
  Vertebrate Animals (Prior SRC Approval): Forms 5 and 2 or 3
  Tissues, organs, Human or Animal Parts, Blood, Teeth, Non-plant Cell Cultures or Body Fluids (Prior SRC Approval): Form 6
  Hazardous Substances or Devices: Form 3

When completing research plan, carefully think through variables including constants. Make sure variables are clearly handled in procedure. Also make sure procedure is detailed enough so that

another person could complete your experiment from your research plan. Include a materials list as part of your procedure. Make sure you include multiple data trials, specify material quantities, include chemical solution concentrations, methodology for preparing any needed solutions, diagrams for setups, blueprints for building needed equipment, etc.

Engineering projects should state engineering goal instead of hypothesis. In addition, engineering projects should define a need, develop design criteria, prepare preliminary designs, include instructions on how to build a prototype, and instructions on how to test/evaluate whether the prototype meets the engineering goal. Multiple tests should be done. Based on these results, the prototype should be redesigned and retested as needed.

Check flow charts on web site carefully to make sure you have all appropriate forms completed. All forms must be **completed and signed by mentor prior to data collection.**
You may be asked to revise your research plan before continuing project, **it is imperative you meet deadline of when forms are due in order to allow sufficient time to perform and analyze experiment.** Once you have gotten signed forms back, and your research plan has been approved, you should transfer your materials and procedure (including variables, hypothesis, etc….) to your log book and then you are ready to start experimentation.

Before beginning experimentation, place signed forms in a 3-ring science project notebook. Don't forget to update table of contents as new sections are added to your bound logbook.

6. Writing the Introduction (Rationale) (September)
Additionally, you must hand in a separate typed (or computer printout) "Project Rationale" before beginning experimentation. The Introduction/Rationale, written in 3rd person, explains the background information about your topic and the reasoning behind your choice of study. Refer to previous research/ experimentation done on your problem. Make sure all background information relates specifically to your problem and is significant to the understanding of the problem. Parenthetical references are to be used throughout the paper and a bibliography should be included at the end of the paper. (Make sure you use MLA format.) This paper must establish a strong rationale for the study by emphasizing unresolved issues or questions (i.e. why this experiment needs to be done). Conclude by stating the research hypothesis (this should be in the last paragraph of your Introduction-possibly the last sentence). See classroom example of Venus Flytrap Paper. What is her reasoning behind studying this aspect of Venus flytraps? What is some previous research that was done on Venus flytraps? How does her experiment differ? What is an example of a parenthetical reference? What is the unresolved issue that her experiment hopes to answer? What is her hypothesis?

7. Doing the Experiment (October)

a. Set up data tables for project in new section immediately following research plan section. All data must be directly recorded in these tables. **DO NOT WRITE DATA DOWN ON SCRATCH PAPER WITH THE INTENT TO COPY IT INTO THE BOOK LATER EVEN IF YOU THINK IT WILL LOOK NEATER THAT WAY.** That's why it's important you give careful thought to the construction of the data tables **BEFORE YOU BEGIN EXPERIMENTATION.** Be sure to include SI units (No English units unless that is the only way possible – for ex.: a radar detector only measures in miles per hour) for all measurements as well as proper headings for all columns in your charts. Remember all entries must be in ink. Cross out (do NOT obliterate) any mistakes and then write corrections. **No white out!!!**

b. Your Journal is a narrative section outlining what you are doing and what you are thinking while you are collecting data. Keep detailed notes in the Journal section for every step of the experiment. Every time you work on your experiment, record the date, time (start &

ending time), location, and observations. Include any thoughts, questions, new ideas, problems, failures or changes you make in your procedure as you go along.

If your results are inconclusive, time permitting, don't just stop. It may be advisable to repeat your experiment in order to verify the data. Remember multiple trials, control groups, experimental groups. Remember to take pictures as you go along. Make sure you are collecting **quantitative data**. Plant growth studies need to measure at least 5 different growth factors. Change in mass is needed for most studies (including corrosion studies, plant studies). Again, don't forget all measurements need to be made using appropriate SI units.
All data should be collected during the month of October (possibly in November).

8. RESULTS/ANALYSIS - Includes all calculations, averages, graphs, statistical analysis, etc. Include brief narrative under each item explaining what the item is and what it means.

a. Consolidating Data (Calculating/ Averaging/Graphing) (1st week of November)
After raw data is collected in log book and all journal entries have been completed, it is time to consolidate data. **In log book**, show all calculations needed (example: mass and volume are raw data, density is a calculation; might not be applicable to all projects) and construct chart(s) showing averages of data. Label all calculations and charts with units and be sure they are clear (control group, etc…). You should use sentences below chart or within calculations to explain what you are doing.

For Project Notebook (Divider #3, Research Paper, Results), use a spreadsheet program like Excel to provide charts with averages (like in log book-not raw data) and graphs. Include brief narrative under each item explaining what the item is and what it means. Pie or bar graphs are used for comparison data (stressed plants grow an average of 60 cm and nonstressed plants grow an average of 56 cm) and line graphs are used to show changes/trends (as temperature increases, solubility of gases decreases) in data. The CHHS Media Center provides color copies for a charge. You may work on your charts/graphs in the science computer lab during scheduled times or in the Media Center. You may save your information in your school folder or bring a disk in from home. You will need 2 copies of each chart and graph (3 ring binder and display board). You will not have graphs in your log book (no taped materials) unless you choose to hand draw them in. Also include sample calculations in this section.

b. Statistical Analysis (10th-12th grade required) (2nd week of November)
Students are required to do a t-test or chi square test. Standard Deviation is recommended when applicable. See handout on Statistical Analysis and Venus Flytrap paper.

9. Writing the Discussion and Conclusion (November/Early December)

a. Discussion – This section is the heart of your paper-here is where you will pull it all together. Your logbook will be the rough draft and you will just have a series of bullet statements of your ideas for this section. Have your mentor read your rough draft (log book bullet statements) and give you feedback for your final paper. The Discussion for your paper will be at least 2 pages and be in narrative form. Here you will (writing in 3rd person) explain your results fluidly and logically. Be thorough. Compare your results with theoretical values, published data, commonly held beliefs and/or expected results. To do this you will use the information from your Introduction/Rationale and compare it with the data you collected. You will discuss your null hypothesis and whether or not your data is statistically significant or not. A complete paper should include a discussion of possible errors or problems experienced. Be sure to relate your data to your hypothesis – was it supported or not? Why or why not? Your paper should flow, not just be a collection of answers to these issues. Here are some questions

that you might consider when writing your paper: So what does your data really mean to the world? Why is your project important? Why are your results important and what implications do they have? What possible explanations can you offer for your findings? What were the major findings? Here are some expressions you might use in your paper: "It was found that….", "This study was performed to…", "The data is consistent with….", "Although not statistically significant, there appeared to be a trend towards….", "It is believed that the experiment might actually be significant if more trials were performed. …".

b. Conclusion – A brief (one paragraph generally) conclusion to your paper. It should include:

1. Restate hypothesis and whether or not data supported it
2. The Major point/idea(s) that you want to leave your audience with
3. Further research ideas

In other words, what you tried to accomplish, what you actually accomplished, what main ideas you want to emphasize, and where do you go from here with continued research.

December will be spent organizing the final paper into the 3-ring notebook, writing the abstract, and completing the Display Board.

10. Abstract (December)

The abstract is a concise summary of the entire research project. The abstract needs to be especially good since often judges form first opinions from the abstract. The following elements should be included in a proper abstract:

Title, Problem (what specific questions are addressed in the study, variables and limitations are identified, intent and objectives of the research effort are made explicit in this statement), Purpose (states the usefulness of the study-answers the question why the project was undertaken), Hypothesis (limits the scope of the investigation and unifies the research design, often is a If/Then statement), Procedure (brief summary of what was done), Conclusions (concise statement of the outcomes of the investigation, relate directly to hypothesis, identify unsolved aspects of the original problem or any new problems identified)

Rules for Abstract: Must be typed on the Official GSEF Abstract Form found on web site, is limited to the square on the form, does not include cover sheets, graphics, etc…, and must be 250 words or less (200 or less for Symposium). Need 2 copies.

Hints: Use past tense and third person. Use correct spelling and sentence structure. Try to avoid use of *highly* specialized words or abbreviations. Restrict procedure to identification of method or type of process employed. State results, conclusions, or findings in clear, concise fashion. See classroom example of abstract of Venus Flytrap Paper.

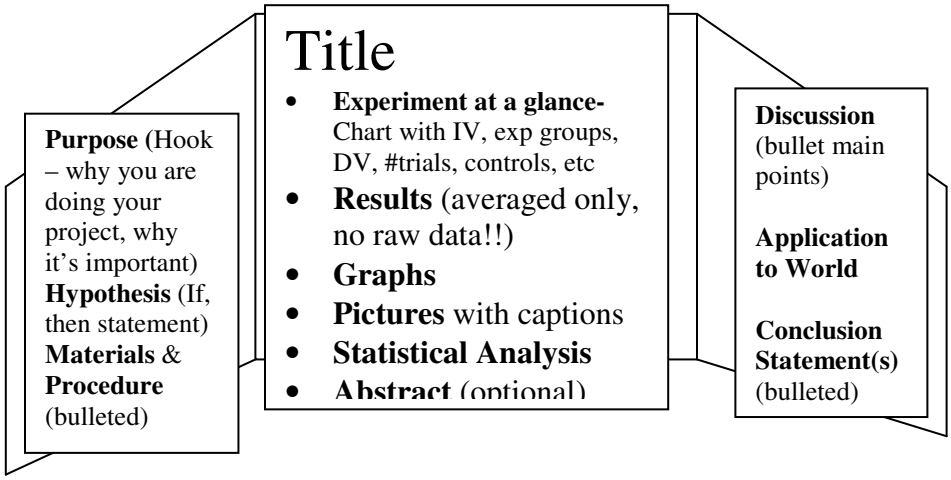
11. Presentation of Project - the presentation of your project requires the following which are due the first week of second semester (see final product overview on page 2 for checklist):

- Display board (see suggestions on following page)
- 3-ring notebook including
  - final paper
  - forms (including abstract on proper form)
  - completed logbook

Paperwork for regional science fair and symposium will be completed at this time.

Science Fair Board & Presentation/Judging

Display Board (suggested format)
(max 30" x 48" x 108")



* Put your name, mentor name & CHHS on top back middle panel

Helpful Hints

- Include photographs of important parts/phases of experiment (subjects abiding by safety standards)
- Be organized – should be logically presented and easy to read
- Make it Eye Catching and Professional – use neat headings, colorful matting, use contrasting colors
- Use the largest font possible and still have everything fit on your backboard
- Pay special attention to the labeling of graphs, charts, diagrams, tables, & photographs.
- Your board should tell your complete research "story" at a glance

Presentation & Judging Guidelines

You may be asked to give a 3- 5 minute presentation of your project in class. You may not read your presentation, it must be rehearsed (note cards may be used).
You must be prepared to answer questions about your project from your teacher, classmates, or judge.

The following items must be addressed:

- Brief description of the project
- Where did you get the idea for your project?
- Variables
- Results
- What would you do differently?
- Application to Real Life

www.uga.edu/oasp. Review rules, regulations, and guidelines.

Evaluating Sources

All sources of information should be evaluated, regardless of whether or not they are published by a major publishing company, printed in a journal or magazine, or found on the Internet. Information can be evaluated for accuracy of content, qualifications of the author(s), research design of the study, and how recent this information is to name a few. While the Internet is a tremendous source of information, it presents unique challenges when attempting to evaluate the legitimacy of the information. While some scientific journals are published on-line with the on-line material subjected to the same peer-review process required for traditional journals, other Internet information is published without any checks regarding legitimacy. There are many outstanding rubrics available for evaluating websites, and you may wish to research this further when beginning the background research for your project. For now, the guidelines below will offer a preliminary, quick check of website accuracy and usefulness.

Authority of the Author and the Web Domain

Be sure that you know the difference between the author and the webmaster (they may be one and the same, but often times the webmaster simply designs the webpage).

- Are the credentials of the author listed? If so, do they seem adequate for the type of research begin conducted and discussed?
- Is there a way to contact the author (address, email, phone, etc.)?
- With what institution or organization is the author affiliated? Is this institution or organization reputable?
- What institution or organization is publishing the document? Check the domain (preferred domains include .gov, .edu, and .org). Is this organization reputable?
- Is there any evidence that the article went through a peer-review process prior to being published (ex: articles printed in the on-line version of a respected journal would be subject to a peer-review process)?

Objectivity of the Author and the Web Domain

Just because an author or institution is affiliated with a commercial or corporate endeavor does not mean that the information is necessarily inaccurate. It may still be very useful. You just need to be aware, however, of who is publishing the article and what the intent of the article is.

- Does the author have an affiliation with an organization that might skew or bias his/her reporting?
- How much of the article is opinion? How much is fact based?
- Is the hosting institution or organization skewed or biased?
- Is the site advertising a product associated with the research?
- What is the intent of the article?
- Who is the intended audience?

Recency of the Document

- When was the site originally published?
- When was the last time the site was updated?
- What are the dates of the other information cited within the document?
- How many of the links are outdated/nonfunctional/broken?

Accuracy of the Information

- Is the information found here consistent with other sources pertaining to the topic?
- Is the information properly cited?
- Is the document sufficiently detailed?
- Is there sufficient evidence supporting the claims made by the author?
- Refer back to the questions regarding the authority of the author and bias. Is the author appropriately qualified to address this topic? Is there bias that the reader should be aware of?

www.uga.edu/oasp. Review rules, regulations, and guidelines.

Checklists to help guide you:

Log Book Checklist (see p. 2-4):
Getting started
_____ Title Page
_____ Acknowledgements
_____ Table of Contents
_____ Pages all numbered
_____ Journal set up and entries (show thought process- not just what you did)

Research Notes
Sources:
_____ 5 Bibliography "cards" in MLA format:
science journals _____ _____
others: _____ _____ _____ : _____ _____ ___
Information:
_____50 Research "cards"
_____Completeness of information:
background, other experiments/studies, procedures, equipment, etc.

Experimental Design
_____Experimental Design is copied into log book.

Data
_____Data Tables are set up (ruler, labeled, well thought out) with captions
_____all quantitative data recorded with units (date top of page)

_____all qualitative data and observations recorded (include dates)

Results
See results checklist-include charts of averages, sketch graphs, include chart of statistics
Discussion
See discussion checklist – include notes/bullets
Conclusion
See conclusion checklist-include notes/bullets

Project Notebook (3-ring Binder) Checklist (see p. 2 – Final Product Overview).

Science Fair Project Forms/Experimental Design Checklist (see p. 2– Final Product Overview)

Forms

_____Form 1 (1 per person)
OR
_____Form 1A (1 per team)
_____Form 1B (1 per individual) requires signatures
_____Other forms

Experimental Design

_____Labeled A-D
_____Problem/Question
_____Hypothesis
"If-then" statement
"If" reflects research*
"Then" offers prediction
_____Procedure
List of materials
Multiple trials
Step-by-step & detailed
Quantitative data collection
_____Bibliography
3 nonencyclopedia sources
2 science journal sources
Proper MLA format
Alphabetical order

Science Fair Project Introduction/Rationale Checklist (see p. 9)

_____ Explains background info on topic
_____ Relates specifically to topic
_____ Significant to understanding topic
_____ Discusses previous research/data related to topic
_____ Why you chose topic
_____ Emphasizes unresolved issues/questions
_____ End with research hypothesis
_____ Writing style, transitions, flow, spelling
_____ Parenthetical references / Bibliography (MLA)

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Results, Discussion, Conclusion Checklist **(see p. 10-11)**

Results

- — Results of data tables (averages, median, range, etc.)
  - — Graph/chart
  - — Numbered; Captioned
  - — Narrative – brief
- — Statistical analysis
  - — Graph/chart
  - — Numbered; Captioned
  - — Narrative – brief
  - — State null hypothesis
  - — Include error in rejecting null hypothesis

Discussion

- — Interpret statistical analysis
  - — Restate hypothesis
  - — Was hypothesis supported by research?
  - — Significant? ($p<.05$)
  - — Discussion of errors or problems
  - — How did they affect results
  - — How could experiment be changed to eliminate errors/problems
- — Compare results with what is already known about research question
  - — Theoretical values
  - — Published data
  - — Commonly held beliefs/expected results

Conclusion

- — Draw conclusions about findings
- — What does all of this mean?
  (Possibly, "in light of the fact that the hypothesis was/was not supported . . .")
- — Discuss possible applications that your findings could support or point to
- — Further experiments or extensions

Display Board / Presentation Checklist (see p. 2,11,12)

_____ Title
_____ Bullets instead of complete sentences
_____ Photos (labeled with captions, safety rules followed)
_____ Board tells your complete research "story" at a glance
(**Chart with IV, exp groups, DV, #trials, controls, etc.**
_____ Hypothesis clear
_____ Data (not raw-averaged only) clearly stated in table format
_____ Data graphed with captions
_____ Statistics clearly shown and explained with captions
_____ Conclusion formed
_____ Items neatly displayed (labeled and matted)
_____ Display board represents project
(put your name, mentor name, & CHHS on top back middle panel)
_____Presentation to Judges
Voice clear
Clear explanation of experiment, results, conclusion
Passionate about project
Answers questions well
Overall impact is positive and knowledgeable

Integrity Contract

Plagiarism: Plagiarism is an act of academic dishonesty. Collins Hill High School defines plagiarism as a student taking credit for work that is not his or her own work. *Examples of plagiarism include:*

- *Buying or using any sort of paper or project from another person or service and turning it in as the product of your own work.*
- *Turning in someone else's work as your own with or without that person's knowledge.*
- *Copying statements from a source and using them without proper use of quotation marks and citations.*
- *Paraphrasing information from a source without proper citations.*

Collins Hill students research, create and write with VISION, INTEGRITY AND STRENGTH.

I hereby attest that all of the work on the science fair project is/will be my own and when necessary, proper credit has been cited to the appropriate source(s).

Print Name: _____

Signature: _____

Witness

Parent Name: _____

Signature: _____

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Name _____Date Submitted _____

SIRS Research Project Approval Form (required)

Which area of research is of most interest to you? (choose one)

Behavioral & Social Sciences	Computers	Mathematics	Space Science
Biochemistry	Earth Science	Medicine and Health	Zoology
Botany	Engineering	Microbiology	
Chemistry	Environmental Science	Physics	

What is your research question? _____

To whom is this project important and why (i.e. why does this project matter)? _____

_____

Complete the following:

Experimental Design for Independent Science Research Projects

Proposed Title: _____

Hypothesis: _____

What research lead you to this hypothesis (may refer to attached article- see below)?_____

_____

Independent Variable (manipulated)	**IV:**			
Experimental Groups (quantify level of IV)	1. (control)	2.	3.	4.
# trials (100 are best!!)				

Justify number of trials_____

Dependent Variable (responding)**, DV: _____**

(How will you measure, units?) _____

Variables you will hold constant and why:_____

_____

Please attach answers to the following questions:

1. Where will you conduct this experiment (remember, certain experiments must be done in a lab setting under supervision—check the UGA website if you are not sure)?
2. Do you have a preference for who will be your CHHS mentor?(you are required to have a CHHS mentor- we can match you with a mentor in your project are)
3. What is the estimated cost of this experiment?
4. Describe your estimated time line for completion of your project by mid-November (see blue packet for requirements).
5. Attach at least one research article related to your topic.

I understand that to receive credit for my project, I must complete the requirements for a science project as described in the blue CHHS packet and UGA website. In addition, this approval form and the science fair forms from the UGA website must be completed and returned with approval BEFORE starting experimentation.

Student signature _____ Date _____

Parent signature _____ Date _____

Mentor Approval _____ Date _____

SIRS Project Approval _____ Date _____

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