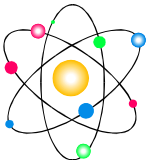
SCIENCE FAIR 2008 EXPERIMENT PACKET

PLEASE return Science Fair Packet in folder after the Science Fair

What in the world do you WONDER about? Observe your surroundings, using all of your senses. Do you have any questions about what you see/hear/smell/taste? Yes? Good! You're a scientist! Do you want to do a science project to answer some of your questions?






A Science Fair project is a learning process. First, brainstorm topics that interest you. Learn more by reading and researching your chosen subject and discuss it with people knowledgeable about it. Then form a question about your topic that might be answered with an experiment, or test. If you can't ask that sort of question, then ask your teacher for the Science Fair Research packet instead of this one. Formulating this question is often the hardest part of any science project, so discuss it with your parents and teachers. Form a question for which you can predict an answer, and then map out a plan (design an experiment) that will test your prediction. Design your experiment to obtain final results that can be observed and measured.

In this packet you will find all the step by step information you will need to create a successful science project. Read through this packet with an adult and be a scientist! We look forward to seeing what you learn!

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WHAT TYPE OF SCIENTIST WILL YOU BE? (Science Fair categories)

MAKING THE DISPLAY: Instructions and visual guide for making your display

EXAMPLE DISPLAYS: Example display from previous Science Fairs

HEADINGS: Headings which you can cut out and use in your notebook or on your display

SCIENCE FAIR RULES: A project must comply with all rules in order to be entered

JUDGING FORMS: The same judging forms are used at both WJE's Science Fair and the Mountain Area Science Fair. The oral interview* judging form is for grades 4 and 5 only

STUDENT/ADULT INVOLVEMENT FORM (GREEN): This form must be filled out, signed and included with your notebook at your Science Fair display

REGISTRATION FORM (YELLOW) Students must complete and return by deadline (Dec. 15)

***** ***Note to 4th and 5th grade students – At Science Fair, the judges will briefly interview you (sample questions on p. 14) in front of your Science Fair project display.***

• SCIENTIFIC METHOD •

Steps to a Successful Science Project

Be sure to **record** how you perform each of these steps in your notebook! Create your science project notebook by first getting a blank notebook. Then create headings in your notebook pages of each STEP below.

1. MY INTERESTS/BRAINSTORMS (this part is in your notebook, not on final display)
   - What do you wonder about? What things do you like to do?
   - I am interested in . . . .
   - Web or outline in your notebook your interests and brainstorms.
   - Look at your brainstorms and choose one topic

2. **BACKGROUND INFORMATION** / **OBSERVATIONS** / **RESEARCH** ABOUT YOUR TOPIC
   - What do you already know about your chosen topic?
   - Find more information in the library; ask the librarian to help.
   - Ask your teacher what he/she knows about your topic.
   - Talk to other people who are experts in your topic area.
   - In your notebook, record what you find out and list your sources of information.

3. ASK A **QUESTION** ABOUT YOUR TOPIC (DEFINES YOUR **PURPOSE**)
   - From your knowledge of your topic, what questions come to mind (web or outline again?)
   - What else would you like to know about your topic?
   - Web or outline some of your questions.
   - Choose one of your questions and think of some ways you could answer it. Write this in your notebook, it is the **PURPOSE** of your science project.
   - Form your question in a way which you can answer it by doing an experiment. (This is sometimes a hard step, so get help if you need it). MAKE SURE your experiment is SAFE and that you have what you need to actually do it. You can generally rule out things like large explosions and space travel.

*******If your question cannot be answered by doing a test or experiment, it is a RESEARCH or DEMONSTRATION type project, so skip to STEP # 6 (next page). NOTE: You may submit a project to Science Fair in the Research Category only if you are in K-3rd grade).**

4. FORM A **HYPOTHESIS** (PREDICTION)
   - A hypothesis is what you think is the best answer to your question. It's what you predict will happen when you do your experiment.
   - Pick your hypothesis from your list of possible answers to the question. To make the best choice, write down why each answer might be correct.

5. **PROCEDURE** (DESIGN YOUR EXPERIMENT to TEST YOUR HYPOTHESIS)

- Think of some sort of repeating test you could do which would help you answer your question.
- Write down your plan to answer your question.
- Write out each step of your experiment.
- List the **MATERIALS** you'll need (including safety equipment).
- List the measurements you'll make, and how you will record them.
- Define your **VARIABLES**, which are anything that can affect the outcome of your experiment and your **CONTROLS**, which are anything that you try to NOT change in your experiment (See Parent Supplement for a complete discussion of variables and controls).
- For observation-type experiments (earth structure, weather, etc.), write out the observations you predict based on your hypothesis. You will compare these to your actual observations.
- Perform the experiment, and make the observations. Include dates and times as necessary!
- Record measurements and all your data in your notebook, including the timing of events.
- Repeat the experiment several times to measure variation in results.

6. **RESULTS**

- Write down what happened or what you found out. Put any measurements, observations, and data into charts or graphs.
- Have you answered your original question?
- Did your experiment test your hypothesis? (Not applicable for a RESEARCH project).
- If not, can you do a different experiment to test your hypothesis?

7. **CONCLUSIONS**

- What did you find out? Were you surprised?
- Study your RESULTS and make sure you have answered your original question.
- Decide whether you got the answer you expected (it's OK if you didn't!). Can you explain why or why not?
- Would you do any part of your project differently?

8. **PRESENT** TO OTHERS WHAT YOU FOUND (SHOW OFF!) (display poster)

- Summarize your project and what you learned in a poster display, following the accompanying suggestions and rules.
- What new questions do you now have about this topic? What other experiments or observations might add to your knowledge?

• WHAT TYPE OF SCIENTIST WILL YOU BE? •

Select your category from the list

1. Aerodynamics/Fluid Mechanics
2. Botany
3. Chemistry
4. Earth and Environmental Science
5. Electricity, Electronics and Magnetism
6. Human Body, Health, and Behavior
7. Material Science
8. Microbiology
9. Physics
10. Structures
11. Zoology
12. Research/Demonstration (K,1,2,3 only)

Here are some ideas of possible topics within each of these categories. Use your imagination. Almost anything can be a good topic for a project. Many projects fall into more than one category – you choose the category. The science fair coordinators may suggest category changes in order to maintain consistency among entries.

1. AERODYNAMICS/FLUID MECHANICS: rocketry, paper airplanes, water currents

2. BOTANY: plant growth, effects of pollution, climatic changes, insects and plants, rainforest studies, ecosystems

3. CHEMISTRY: elements, evaporation, crystals, expansion/contraction of materials, acid/base reactions, alkalinity

4. EARTH AND ENVIRONMENTAL SCIENCE: weather, fossils, mineral resources, volcanoes, earthquakes, erosion, currents, air/water pollution, recycling, ecology/ecosystems, wetlands

5. ELECTRICITY, ELECTRONICS AND MAGNETISM: solar power, battery life, power production, energy conservation, radios, computer design, radar, lasers, magnets

6. HUMAN BODY/HEALTH & BEHAVIOR: nutrition, effects of drugs, disease prevention, learning, exercise, color perception

7. MATERIAL SCIENCE: earthquakes, pollution, strength estimates, insulation properties

8. MICROBIOLOGY: types of organisms, microbial activity (e.g., decomposition, composting)

9. PHYSICS: light, mass, liquids/solids/gases, mechanical advantage, planets/space/galaxies/ exploration, machines/motion, collisions of bodies (billiard balls, cars), heat & combustion.

10. STRUCTURES: bridge strengths/failures, geometry (e.g., Roman arches), architectural designs and function

11. ZOOLOGY: pet studies, nutrition, life cycles of insects, pond life, food chains

12. RESEARCH / DEMONSTRATION (option for K-3 only): an investigation or research into a topic of the student's choice, which does NOT have to pose a testable question, but results of which must be summarized and presented in the same format as other projects, and which will be judged and scored but not ranked. Examples include collections/studies of seashells or rocks, evolution, wolf re-introduction into Yellowstone Park, hovercraft, art forms, volcanoes.

• MAKING THE DISPLAY •

1. Make a display backboard that will stand up by itself. For example, you could use a box with its top and front cut away, plywood, or three foam board or card board sheets hinged with tape. Pre-made trifold display boards are available at our school store, hobby stores and office supply stores.

2. Plan your display so that it tells the story of your project. Each step of the scientific process should be part of your display. However, if you are only doing a RESEARCH/DEMONSTRATION project, you will not need to include each step of the scientific process. Including some of what you learned when you researched the background of your topic can add to viewer understanding and interest. A common organizational theme for a science fair display often follows the outline you have made in your notebook and appears as such:

BACKGROUND INFORMATION / OBSERVATIONS / RESEARCH: Explain what you already knew, observed, and then learned new about your topic which caused you to ask your question.

QUESTION / PURPOSE: Explain why you are doing your project as directly and clearly as possible. Usually, this takes 1-3 sentences.

HYPOTHESIS / PREDICTION: State what you think will happen when you perform your experiment/observation. This usually takes 1-2 sentences.

MATERIALS: Make a list of the basic materials you used in the project.

PROCEDURE: Tell step by step what was involved in doing your experiment. It is good to number each step.

RESULTS: Show your facts (observations, data, measurements). Use charts, graphs, pictures, photos, or any other visual aids.

CONCLUSION: Explain what you learned based on the results you got. Tell why you think you got these results. Explain how you answered your question, and whether your prediction was correct. Remember, it is ok if your prediction is wrong; in fact, sometimes 'unexpected' results are the best kind and lead to new discoveries!

3. Make sure your name cannot be seen by the judges. Photographs should not include you or members of your family.

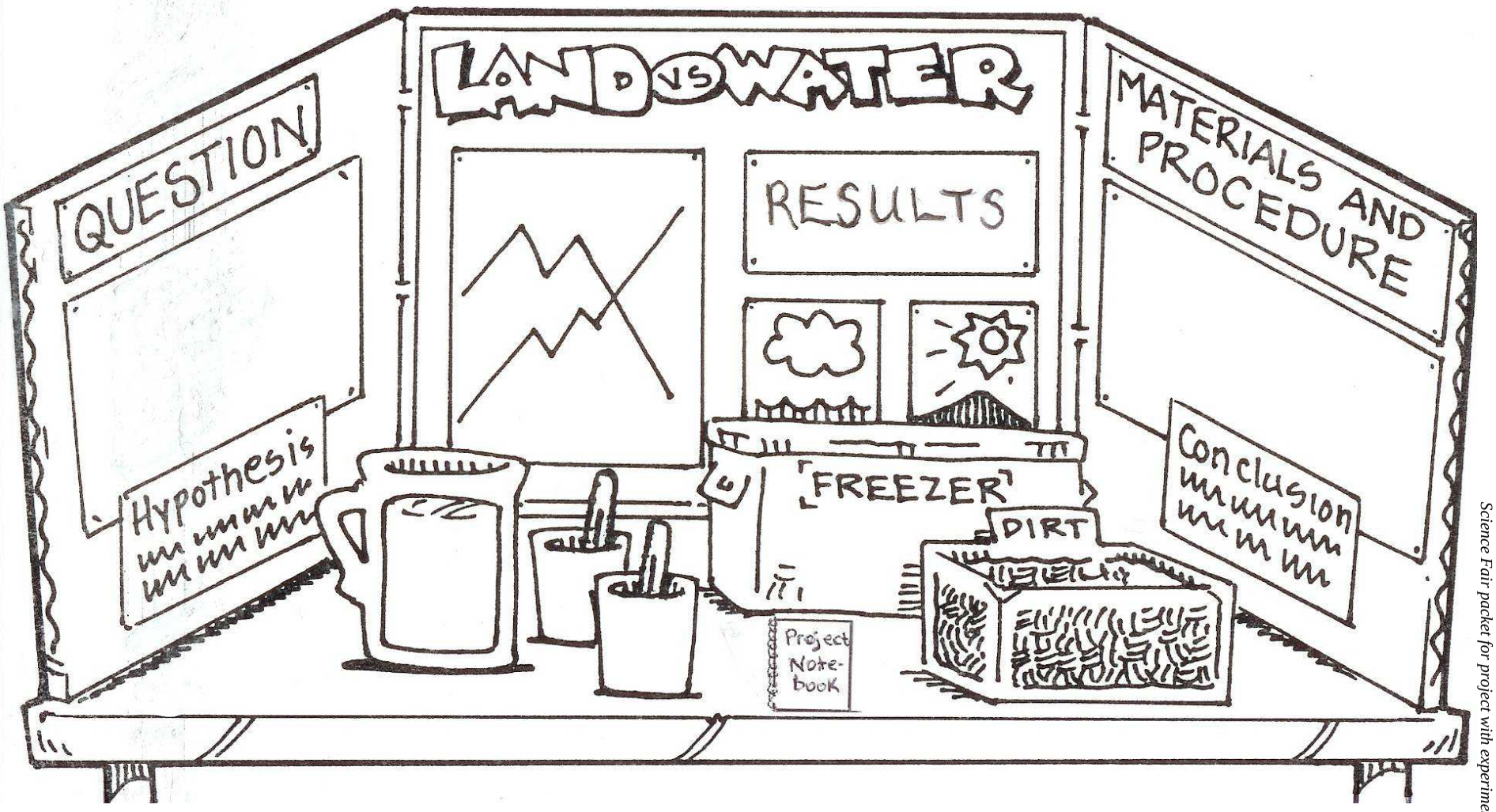
4. Put your project title on the front of your notebook and place it in front of your display. You can also place samples or equipment with your notebook. Expect that viewer and judges will want to handle sample and equipment. You cannot display high voltage equipment, dangerous chemicals or live animals. Place a DO NOT TOUCH sign by messy or fragile items.

5. Fill out the STUDENT/ADULT INVOLVEMENT FORM and put it with your display. Be sure your display follows the guidelines on the SCIENCE FAIR RULES PAGE in this packet.

6. The next page shows a sketch of what a display board set up on a table at the Science Fair might look like. Notice the notebook and exhibits.

7. The following page includes a "mini display board example" taken from an actual Elk Creek students' project. It from an experiment-type project done by an Elk Creek student. Fold the examples on the lines to view the "mini-display." These might give you some ideas on how to build your own display.

TABLE DISPLAY EXAMPLE



• HEADINGS FOR YOUR NOTEBOOK AND DISPLAY •

EXAMPLE OF A SCIENCE FAIR EXPERIMENT DISPLAY

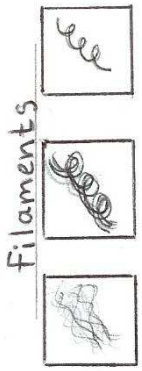
THE AMAZING LIGHT BULB

QUESTION/PURPOSE

The purpose of this project was to explain how a light bulb works. There are 2 parts to the experiment part of the project. First, I wanted to see if there would be a difference in the brightness of our homemade light bulb when we changed the filament. Second, I wanted to see what type of light bulb would burn out the quickest.

HYPOTHESES

I thought that a 5-stranded braided picture wire would be the brightest burning filament. I thought that the steel wool filament would burn out the quickest.



the squares with the filaments were the actual filament sealed in a square of plastic wrap

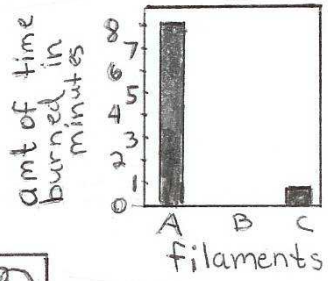
these filaments were my INDEPENDENT VARIABLES

MATERIALS

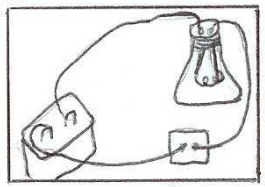
- Switch from my "Electrowiz" kit
- 12 volt battery
- 250 ml flask
- rubber stopper with 2 holes
- 3 feet of insulated copper wire
- braided picture hanging wire

Background Information

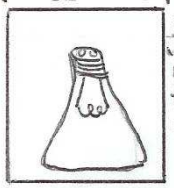
A light bulb is a vacuum chamber. Inside of it is a filament (a fine, thin, thread, fiber or wire) which acts as a resistor (see my notebook for definition of a resistor). When electric current passes through the filament, resistance build up until it becomes incandescent (emission of visible light as a result of being heated). All light bulbs that we see around us are vacuums. If they weren't vacuums, the oxygen in the air would combine with the filament and burn it out.



battery, switch and flask set up



(these were photos)



filament A glows for 8 minutes

RESULTS

The single wire strand burned the longest. After 8 minutes we shut of the switch, so I don't know how long it would have taken to burn out. The five strand braided wire did not glow at all. I knew that the current was flowing through because I could feel the wires on the switch heat up. The thin steel wool burned out the quickest, but was brighter than either of the thin wires. We rolled a real thick piece of steel wool and this burned brighter than a thin roll of steel wool and part of it burned up like a fire

PROCEDURE

- cut copper wires into 3 sections, 1 foot each
- stripped 2 inches of insulation from one end of 2 of these wires and secured these ends into rubber stopper on flask
- the other ends of the wires and the 3rd wire were used to connect the battery and switch to the flask (see picture)
- wrapped the filaments around a nail to form coil shape
- attached filament A, B, and C, in turn, to the 2 inch section of wire hanging from the rubber stopper inside flask
- turned on switch (home made from paper clip and brad) and observed
- just for fun, after seeing how bright the steel wool burned, we experimented with different thicknesses of steel wool (but we did not report on this)

CONCLUSION

My first hypothesis was incorrect. The thicker wire did not even burn at all. My research taught me that electric current is like the flow of water. When water is squeezed through a tighter hose, it comes out with more force. A tight hose is like higher resistance in electricity. This is why the real thin "hairs" of the steel wool burned so brightly. I was right for the second part of my hypothesis: the steel wool burned out the quickest. I think this was because it was so light (in weight).

AN IDEA FOR ANOTHER EXPERIMENT WOULD BE TO CHANGE THE BATTERY AND SEE WHAT THE FILAMENT WOULD DO!!

MY INTERESTS/BRAINSTORMS (should appear in your notebook, not necessarily on display board)

BACKGROUND INFORMATION & OBSERVATIONS

MY QUESTION (PURPOSE)

MY HYPOTHESIS (PREDICTION)

MY PROCEDURES

MY MATERIALS

*MY VARIABLES (should appear in your notebook if you did an experiment, not necessarily on display board)

MY RESULTS (facts, observations, data, measurements)

MY CONCLUSIONS (analyze and explain your results)

• SCIENCE FAIR RULES •
Check your project and display against these rules

1. __ Limit the size of the project to a base area of 3 feet deep, 4 feet wide, and 4 feet high. It may sit on a table or the floor; it should stand alone.

2. __ All displays must be constructed by one student during this school year. The display must be one individual's project; no group projects will be accepted. Only one entry is allowed per student. Notes and notebooks (**without** your name or other identifying marks) should accompany the display.

3. __ An adult may give advice and assistance during development, research, and construction of the project. The STUDENT/ADULT INVOLVEMENT FORM included in your packet MUST be completed and signed by an adult and included with your project. The extent of adult involvement is one of the factors considered by the judges.

4. __ Bacterial cultures must be sealed.

5. __ Experiments involving the use of live animals must demonstrate and document appropriate humane treatment of these animals.

6. Judges are permitted to disqualify any project that is not based on scientific premises, and no ribbon will be awarded to such a project.

7. Each display will be judged by a panel of qualified judges. Where possible, each judge will have professional expertise in the category of an exhibit.

8. Each display will be assigned a numbered code during registration. After judging, your name will be attached to your project.

9. __ **DO** include the following <u>with your display</u>:
   - __ 1) Notebook showing your data-gathering.
   - __ 2)Research to formulate the question you asked.
   - __ 3)All measurements you made.
   - __ 4)Make sure your name is NOT on these materials
   - __ 5) Your signed Student/Parent Involvement Form (green).

10. __ Do **NOT** include/use the following <u>in your display</u>:
    - __ 1) Name, photo identifiable as yourself or family, teacher's name or other identifying marks.
    - __ 2) Flames, toxic or flammable chemicals.
    - __ 3) Live animals.
    - __ 4) Electrical outlets – only low voltage batteries are allowed.

11. __ Displays must not pose any physical hazards to the school, judges, other participants or viewers.

The school or PTA cannot take any responsibility for damage to displays. They are entered at your own risk.

MOUNTAIN AREA SCIENCE FAIR PROJECT JUDGING SHEET

PROJECT # _____CATEGORY_____

TITLE_____

The following are the criteria by which ALL Mountain Area Science Fair projects are to be judged.

	Points: max = 45
1. Appearance: Neat, clean, attractive overall	**0 1 2 3**
2. Communication: The display clearly shows student's understanding of project's purpose, methods and findings.	**0 1 2 3 4 5**
3. Creativity/Originality: In thinking & communication	**0 1 2 3 4 5**
4. Student Involvement: The more, the better	**0 1 2 3 4 5**
5. Lab Notebook: Careful recordkeeping that follows the student's project from start to finish. This should include dated entries with experimental design, predictions, data collection & relevant material.	**0 1 2 3 4 5**
6. Research Question & Hypothesis: purpose/problem clearly defined; hypothesis testable.	**0 1 2 3 4 5**
7. Background Research: Relevant information gathered and presented in display or notebook.	**0 1 2 3 4**
8. Experimental Design: Hypothesis adequately tested Dependent, independent variables properly used.	**0 1 2 3 4**
9. Sample: Repeated measures of dependent variables. **Control:** Controls defined and used properly.	**0 1 2**
10. Analysis: Data appropriately used.	**0 1 2 3 4**
11. Conclusions: Clear, understandable, objective; follows from the original research question.	**0 1 2 3**
	TOTAL_____

CATEGORY RANK (1st, 2nd, or 3rd only) _____
(Project score must total ≥ 30 pts to place)
(IF Div II, Project + Oral scores must total ≥ 42 pts to place)

COMMENTS:

ORAL JUDGING SHEET
Division II (Fourth and Fifth Graders Only)

PROJECT # _____CATEGORY_____

TITLE_____

1. Can the student explain the purpose and motivation of the project?	**1 2 3 4 5**
2. Does the student show knowledge of the subject matter and theory used?	**1 2 3 4 5**
3. Can the student explain all the elements of project development?	**1 2 3 4 5**
4. Can the student explain the project results and conclusion?	**1 2 3 4 5**

ORAL SUBTOTAL (20 max points) _____

PROJECT SUBTOTAL (45 max points) _____

TOTAL SCORE _____ (of 65 max)

CATEGORY RANK (1st, 2nd, or 3rd only) _____
(Project + Oral scores must total ≥ 42 out of 65 pts to place)