

Hazardous Chemicals, Activities & Devices Guidelines

The following guidelines are to be used in completing the Risk Assessment Form (3) that is **REQUIRED** for all middle school projects. They are designed to help protect the Student Researcher by ensuring they have proper supervision, all potential risks are considered and appropriate safety precautions are taken. Special attention has been brought to substances and devices that are also regulated by local, state and federal law.

Hazardous Chemicals

Student Researchers utilizing chemicals (household and laboratory) in their studies should consider all of the following when completing their Risk Assessment Form 3.

- Chemicals must be acquired and used in accordance with all local, state and federal laws.
- The Student Researcher must review the Materials Safety Data Sheets for ALL chemicals (household and laboratory) used in the project.
- For all chemicals requiring a federal and/or state permit, the Designated Supervisor must obtain the permit PRIOR to experimentation and a copy of the permit must be submitted to the Regional Science Fair and/or CSEF in order for the project to qualify for competition.
- The Student Researcher should take into account a chemical's toxicity, reactivity, flammability and corrosiveness when completing the risk assessment form.
- The Student Researcher must minimize the impact of an experiment on the environment by using minimal quantities of chemicals and making sure all disposal is done in an environmentally safe manner and in accordance with good laboratory practices.
- There is a list of chemicals that are prohibited and restricted for use in Colorado schools that can be found on the Colorado Division of Environmental Health & Sustainability's web site: https://www.colorado.gov/pacific/sites/default/files/DEHS_Schools_ChemicalShelfLifeDesignations_rev2.xlsx

DEA-Controlled Substances

The US Drug Enforcement Agency (DEA) regulates substances that can be diverted from their intended use to make illegal drugs. DEA controlled substances and their schedule number are available at the DEA web site (<http://www.deadiversion.usdoj.gov/schedules/>). Special precautions must be taken when Student Researchers utilize DEA-controlled substances in a project:

- It is the responsibility of the Student Researcher/Team Leader in consultation with the Designated Supervisor to consult the DEA schedule list if there is a possibility that substances used in experimentation could be regulated.
- All studies using DEA-controlled substances must be supervised by a Qualified Scientist/Mentor who is licensed by the DEA for use of the controlled substance being used.
- All studies using DEA-controlled substances must be conducted at a Regulated Research Institution and NOT at a school.
- All studies using DEA Schedule 1 substances (including marijuana) must have the research plan approved by the DEA PRIOR to experimentation.
- Schedule 2, 3 and 4 substances do not require prior approval by the DEA.

Drones

Studies involving unmanned aircraft systems/drones must follow all federal, state and local laws. Typically a permit or registration of the aircraft will be required for certain sized drones/unmanned aircraft to be flown outside. Check out the Federal Aviation Administration (FAA) web site for more details. (www.faa.gov/registration).

Prescription Drugs

Prescription drugs are drugs regulated by federal laws to protect against inappropriate or unsafe use. Special precautions must be taken when Student Researchers utilize prescription drugs in a project:

- It is the responsibility of the Designated Supervisor to properly acquire the drugs from a doctor or pharmacist, using a prescription written out specifically for Science Fair research ONLY and NOT to an individual.
- All prescription drugs used in a student research project must be kept in a locked cabinet, accessible by the Designated Supervisor ONLY, when not being used by the Student Researcher.
- Any unused prescriptions drugs must be disposed of in a proper manner.

Alcohol & Tobacco

The US Alcohol and Tobacco Tax and Trade Bureau (TTB) regulates the production of alcohol and distribution of alcohol and tobacco products. Special precautions must be taken when Student Researchers work on projects that include alcohol and tobacco, given their age:

- Fermentation studies in which small quantities of ethyl alcohol are produced are permitted.
- It is the responsibility of the Designated Supervisor to properly acquire, store and dispose of any alcohol and/or tobacco used in the study.
- Student Researchers are allowed to design and conduct research projects, under DIRECT parent supervision, involving the LEGAL production of wine or beer. It is the responsibility of the Designated Supervisor to make sure the home production meets all of the TTB regulations for such production.
- Studies involving the production of consumable ethyl alcohol by distillation are PROHIBITED.
- Studies involving the production of ethyl alcohol by distillation for fuel or other non-consumable products is allowed at a school or Regulated Research Institution only.

Weapons, Firearms & Explosives

The US Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) regulates the purchase and use of firearms and explosives. Special precautions must be taken when Student Researchers utilize firearms and/or explosives in a project:

- A firearm is defined as a small arms weapon from which a projectile is fired by gunpowder.
- An explosive is any chemical compound, mixture or device whose primary purpose is to function by explosion. These include, but are not limited to, dynamite, black powder, pellet powder, detonators and igniters.
- It is the responsibility of the properly TRAINED Designated Supervisor to lawfully purchase any firearms and/or ammunition to be used by the Student Researcher.
- A diagram of the shooting area must be included with the Research Plan. All buildings and roads need to be included in the diagram as well as where the Student Researcher will be shooting from and the target area.
- Studies involving firearms and ammunition are allowable under the DIRECT supervision of a Designated Supervisor who has completed a hunter safety program or similar firearms safety course. Proof of training will be required when submitting paperwork to the Regional Science Fair and the CSEF for competition.
- Student Researchers using firearms in a project must have completed a hunter safety course. Proof of training will be required when submitting paperwork to the Regional Science Fair and the CSEF for competition. The Colorado Parks & Wildlife provide hunter safety classes.

- Projects involving explosives are allowable under the DIRECT supervision of a Designated Supervisor and when in compliance with all federal, state and local laws.
- Studies involving a fully assembled rocket motor, reload kit or propellant modules containing more than 62.5 grams of propellant are subject to the permitting, storage and other requirements of federal explosive laws and regulations.
- All bows and arrows are not considered firearms, but the Student Researcher and Designated Supervisor should have appropriate training in the safe use of such weapons. The Colorado Parks & Wildlife provide bowhunter education classes.
- Potato guns and paintball guns are not considered firearms unless they are intended to be used as weapons, but they must be treated as hazardous devices.

Other Hazardous Devices & Activities

Due to middle school Student Researcher's young age and limited experience, the CSEF requires that ALL projects complete a Risk Assessment Form (3) and assign a Designated Supervisor to DIRECTLY supervise the student while working on the project. Students and supervisors should think about ALL potentially hazardous devices, chemical and/or activities that might be associated with the project they are working on and how to best keep everyone safe. The following are common hazards that are overlooked:

- Household chemicals and solutions should be treated the same as laboratory chemicals and students should read the Materials Safety Data Sheets that can be found online on how to safely use them – especially if they are using them for purposes other than their intended household use in a science project.
- Cooking stoves and ovens should be treated the same as laboratory devices and students should be taught how to use them in a safe manner – especially when heating items to high temperatures.
- The use of power tools must be supervised by a Designated Supervisor who has significant training or experience using such devices. Student should be clear in their research plan about the type of tools they plan on using (manual or power tools).
- Studies involving radiation that is beyond that normally encountered in everyday life must consider the level and duration of exposure.
 - Normal radiation found in everyday life comes in the form of non-ionizing radiation, including the spectrum of ultraviolet, visible light, infrared, microwave, radiofrequency and extremely low frequency.
 - Ionizing radiation has enough energy to remove tightly bound electrons from atoms, thus creating ions and health hazards when exposed for long periods of time. Examples include high frequency UV, x-rays and gamma rays.
 - Lasers usually emit visible, ultraviolet or infrared radiation and are allowed to be used by Student Researchers as long as they are in a fixed position. **Remember that lasers and laser pointers are not allowed to be used during science fair competitions.**
 - All studies involving exposure to radiation may not exceed the dose limits set by the Nuclear Regulatory Commission of 0.5 mrem/hour or 100 mrem/year of exposure.
 - Any study requiring between 10 and 25 kvolts must be conducted at a Regulated Research Institution and be preapproved by the school/local SRC.
 - Any study requiring more than 25 kvolts must be conducted at an institution with an Licensed Radiation Program and be preapproved by their Radiation Safety Officer or Committee that oversees the use of ionizing radiation.