Literacy and Essential Skills in Industrial Arts

JEWELLERY MAKING COURSE

ESSENTIAL SKILLS

Student Notes

A project of Literacy Ontario Central South

Canada
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Literacy Ontario Central South

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The Literacy and Essential Skills Project Team

Lesley Hamilton – Project Manager
David Haw – Project Coordinator
Shelley McCarrell – Project Assistant
Elise Noriega – Project Assistant
Carrie Wakeford – Project Writer
Brigid Hayes – Project Evaluator

Advisory Committee

Andrew Rothfischer – Ministry of Natural Resources
Doug Noyes – Literacy Link Eastern Ontario
Kathy Neill – John Howard Society of Peterborough
Sheila Cowan – LOCS Board of Directors
Walter Johnstone – Youth Emergency Shelter

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DISCLAIMER:

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This manual is intended to provide an opportunity for students to learn about the Essential Skills and Jewellery Making in both a real life situation and an LBS environment. This manual provides basic guidelines for safe practices inside a literacy setting. Do not assume, therefore, that all necessary warnings, precautionary measures, and legal standards are contained in this document and that other or additional measures may not be required.

The opinions and interpretations in this publication are those of the author and do not necessarily reflect those of the Government of Canada.

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ORIENTATION

WELCOME

Document Use

Welcome to the introduction for jewellery making.

This course was designed with four primary goals.

1. To help you develop your Essential Skills; skills that will help you in your "work, learning and life"
2. To help you develop technical skills for a hobby as well as for work
3. To help you develop your artistic and creative abilities
4. To give you the opportunity to have fun, meet new people and expand your network of contacts

Call the instructor to let them know if you are unable to attend a class.

COURSE FORMAT

Reading Text, Document Use

In addition to the information in these Student Notes, this course will be presented through a mix of group instruction, demonstration and discussion, followed by independent work.

There will be times when your instructor may ask you to stop what you are working on so that they can provide information to the entire class.

It will be important that you ask other students for help. Helping each other and sharing ideas and opinions is a great way to learn.

Before you are asked to complete any step in this jewellery making course, your instructor will provide a demonstration.

Your instructor will:

- demonstrate the safe use of all the tools, equipment and chemicals you will need in this course including: acetylene torches, flux and pickle
- demonstrate all of the techniques you will be using to complete your project, including: cutting, soldering, sanding and polishing

You will then have the opportunity to try all of the tools, equipment and techniques while working independently on your project.

The instructor will be available to answer your questions and provide individual support and guidance as you work, so ask them questions anytime.

As you work on your own project you will find that there are many ways of achieving the same end result. You may find that the step-by-step instructions in your Student Notes are different than the steps your instructor demonstrates in class. You may also find the same techniques are done differently in an online jewellery making video you watch. This variety will give you options to try until you find the techniques that work best for you.

STUDENT NOTES

Reading Text

Although this course will focus on oral instruction and hands-on work you will also have information and instructions to read.

In this package you will find all the Student Notes for this course. You will be asked to read a section of the notes during each class or you may read the material at home. You can also read ahead in the notes.

These Student Notes include information that will help you learn more about the topics presented and demonstrated in class. They can also be used as a reference and guide as you work on developing your jewellery making skills.

There is a Table of Contents at the front of these Student Notes to help you find the information you need.

At the end of course you can take these notes home with you. They will be helpful as you work on future jewellery making projects.

In your Student Notes, you will find web links. If a recommended site is no longer available, please inform your instructor.

You will be working at your own pace therefore you may find that you are ahead or behind in the notes. Talk to your instructor if you have any concerns.

Note: You can record your own notes on the pages of these Student Notes.

ICON LEGEND

Reading Text

Throughout this course you will see icons in the written material. These icons are designed to help you visually identify the content of the section you are reading.

Icons Include:

STUDENT NOTES – At the top of each page of Student Notes you will find this icon on the left side, followed by the name of the section on the top right side. This icon and the section titles will be helpful if you are looking for information listed in the Table of Contents.

ESSENTIAL SKILLS – Under each section heading you will notice this icon, bordered by two lines. The icon will be followed by a list of words. These words represent the Essential Skills you would use if you actually completed the steps outlined in the section. For example, if the text states that you need to "Measure a piece of wire" you would find Numeracy listed as an Essential Skill. This list will also identify the Essential Skills you are using as you read the information in the section. For example, Reading Text will be listed if you need to read more than two sentences in the section. Document Use will be listed if you need to read a bulleted list or complete a document.

Icon Legend Continued:

ACTIVITIES – Near the end of your Student Notes you will see pages with this icon in the top left corner identifying it as the activities section of your notes. This section includes step-by-step directions for completing your jewellery making projects. If you leave the activities section open as you work it can serve as a guide. Alternatively, you can use this section as a reference tool that you can turn to if you get stuck on any part of your project.

TASK – If you see a "T" at the top of a page, you will find step-by-step directions for completing an Essential Skills task. These tasks are designed to help you develop your Essential Skills while at the same time providing information that will help you with your jewellery making project. In most cases the tasks will be handed out during class and you will be given time to complete them before the class ends. Some tasks are designed to be completed independently and others are designed to be done in large and small groups.

When you see this image in a box on the page there will be some additional information to consider.

ESSENTIAL SKILLS

Reading Text

We consider the Essential Skills component of this course to be very important. These skills provide the foundation that makes it possible to learn all other skills. There are nine Essential Skills; Reading Text, Document Use, Numeracy, Writing, Oral Communication, Working with Others, Thinking Skills, Continuous Learning and Computer Use.

Essential Skills are used every day at work, at home and in a jewellery making studio. While these skills are important in your personal life they are essential for success at work. Essential Skills will help you find and keep a job and manage change in the workplace.

Essential Skills are transferable. This means that the same skill can be used in different situations. For example, in this jewellery making course you will have many opportunities to develop your problem solving skills. You may find that the next time you have a problem at home, at school or at work, your problem solving skills will be stronger.

THE NINE ESSENTIAL SKILLS

Document Use

Experts have identified the nine Essential Skills required for success in the Canadian Workforce.

For more information visit:

www.hrsdc.gc.ca/eng/workplaceskills/essential_skills/general/home.shtml

Essential Skills Include:

Reading Text

Reading materials in the form of sentences or paragraphs

Document Use

Tasks that involve a variety of information displays in which words, numbers, symbols and other visual characteristics (e.g. lines, colours or shapes) are given meaning by their spatial arrangements

Numeracy

Using numbers and thinking in quantitative terms to complete tasks

Writing

Writing text and writing in documents, such as filling in forms, and non-paper-based writing such as typing on a computer

Oral Communication

Using speech to give and exchange thoughts and information

Working with Others

Employees working with others to carry out their tasks

Thinking Skills

The process of evaluating ideas or information to reach a rational decision. They include six specific skills:

Problem Solving

Addressing problems that require solutions

Decision Making

Deciding between options

Critical Thinking

Assessing, evaluating ideas or information to reach a rational judgment of value

Job Task Planning and Organizing

Planning and organizing tasks

Significant Use of Memory

Memorization of procedures, codes, numbers, remembering information, learning from an experience

Finding Information

Using text, people, databases or systems to find information

Continuous Learning

Workers participating in an ongoing process of acquiring skills and knowledge

Computer Use

Using different kinds of computer applications and other related technical tools

ESSENTIAL SKILLS CHECKLISTS

Reading Text

As you work on your jewellery project, read your Student Notes and complete the assigned tasks, you will be developing your Essential Skills.

There will be time at the end of each class to talk with the others in your group about the Essential Skills you used in the class.

There will also be time at the end of each class to complete your own individual Essential Skills checklist. As you complete the checklist you will have the chance to identify all of the Essential Skills you used in the class.

After you have read these introductory notes, you will be able to check off Reading Text on your Essential Skills checklist.

ESSENTIAL SKILLS IN JEWELLERY MAKING

Reading Text, Document Use

Jewellery makers need to draw on their Essential Skills in all nine areas; however jewellery making demands a higher skill level in some areas. For example, jewellery makers need to have strong problem solving skills.

Jewellery makers:

- spot problems and solve them as they work (Thinking Skills, Problem Solving)
- talk with co-workers, customers and clients (Oral Communication)
- complete precise measurements (Numeracy)
- work independently and/or as a member of a team (Working with Others)
- plan and organize the work involved in completing a project (Job Task Planning and Organizing)

On the other hand, writing is not an Essential Skill that would be critical to the success of a jewellery maker, even though at times they may need to record information, write notes to customers and create promotional material.

TECHNICAL SKILLS

Document Use

In addition to the Essential Skills you will develop in this class, you will also develop technical skills as you work on your jewellery making projects.

The technical skills you may develop in this course include:

- using tools such as pliers and cutters
- using equipment such as an acetylene torch
- using solder, flux and pickle
- completing measurements
- creating designs

You will also develop:

- form perception
- motor coordination
- manual dexterity
- colour perception

In this jewellery making course you will be completing a mix of right brain and left brain activities.

Left Brain: logical - accurate measurements, detail, precision, written instructions.

Right Brain: creative - patterns, colour, images, visual demonstrations.

CAREER EXPLORATION

Reading Text, Document Use, Oral Communication

Although this jewellery making course is not designed to prepare you for a specific job, you may discover that you have the skills and interests necessary for a career as a jewellery maker. If you enjoy this course, you may want to research this career path further.

As a jewellery maker or jewellery designer you would be responsible for designing and making original jewellery using precious and semi-precious metals and gems as well as a variety of other materials.

Job titles in this field include jeweller, gold worker, goldsmith and silversmith, jewellery appraiser, watch repairer and watch maker.

The National Occupational Classification (NOC) states:

> Jewellers and related workers in this unit group fabricate, assemble, repair and appraise fine jewellery. Watch repairers and related workers in this unit group repair, clean, adjust and fabricate parts for clocks and watches. They are employed by jewellery, clock and watch manufacturers and retail stores, by jewellery and watch repair shops or they may be self-employed.
>
> For more information about the NOC profile visit:
> http://www5.hrsdc.gc.ca/NOC/English/NOC/2006/Profile.aspx?val=7&val1=7344

You may discover that you also have skills and interests necessary for success in a field related to jewellery making. If you enjoy this course, you may want to research careers such as:

- Assembler e.g. electronics
- Computer repair person
- Visual artist/artisan
- Cable worker
- Plumber
- Welder
- Sheet metal worker
- Metal worker
- Dental hygienist
- Framer

Although the jobs listed above are not directly related to jewellery making, they require some of the same skills.

There are many other jobs that will require the skills you will be developing throughout this course. If you think of one that is not on this list, share it with the others in the class.

SUMMARY

Reading Text

In addition to developing the skills needed to create jewellery, you will also develop Essential Skills and technical skills that will help you at work, school and at home.

As mentioned, there are many jobs that require skills similar to the ones you will be developing. As you work through this course, think about your interests, skills and career. At the end of each day, ask yourself, "What skills did I develop that I could add to my résumé?

STUDIO SAFETY

INTRODUCTION

Reading Text

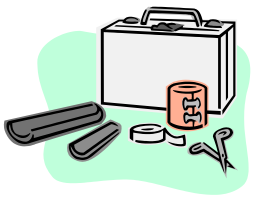
This section of your Student Notes will focus on working safely; this includes your own safety as well as the safety of those around you. There are risks with any hobby, sport or work environment; jewellery making is no exception. The risk is moderate but it is important to be alert, stay organized and practice good housekeeping.

You will be working with metal and sharp tools; therefore it is possible to cut yourself. You will be working with acetylene torches and hot metal; therefore burns are possible. You will also be working with chemicals that could cause a moderate risk to you and the environment if they are not handled properly.

The following information will assist you in developing the skills you need to work safely, efficiently and in an environmentally friendly way. If you follow the safety procedures outlined, you will avoid injuries.

You must follow the instructions provided by your instructor, read this section of your Student Notes and apply all of the recommended safety tips whenever you are watching a demonstration or working on your own project.

Note: This section is only an introduction. Your instructor will provide you with a detailed safety lesson before you begin your project.



ACCIDENT REPORTING

Reading Text, Oral Communication

Minor injuries can be treated with items found in a First Aid Kit; however, we ask that you inform your instructor if you have an injury, even if your injury seems like a minor one.

We also ask that you immediately report any spills, accidents, and/or damage to any tools or equipment. Your instructor will be able to assist you with clean up and repairs.

BURN SUMMARY CHART

Reading Text, Document Use

Serious accidents are rare, but it is important that you work with caution. You will be working with soldering irons and solder that can reach temperatures of 371°-427° Celsius (700°-800° Fahrenheit). To put that into perspective, water boils at about 100° Celsius (212° Fahrenheit).

Degree	Skin Identification	Healing	Treatment
First Degree	Red and painful	Healed in 3-6 days	Soak area in cool water, apply antibiotic ointment and cover with gauze
Second Degree	Red or splotchy, painful, swollen with blisters	Healed in 2 to 3 weeks	Soak in cool water, see your doctor, apply an antibiotic cream, leave blisters, cover with new dressing daily, check your tetanus record, watch for infection, protect it from sunlight and do not scratch
Third Degree	White and charred, may not be painful because of nerve damage	Long healing process	**Seek Immediate Emergency Medical Attention**

- Never put anything oily on a burn, it will make it worse
- When in doubt seek medical attention

SAFETY TIPS

Reading Text, Document Use, Oral Communication

Thinking Skills: Critical Thinking

The safety tips in this section will focus on jewellery making, although many of these tips are transferable to other situations. The tips in this section should be applied whether you are working on your project or watching a demonstration.

Be Alert:

- Work only when you are well rested
- Do not work with tools, equipment or chemicals if you have been drinking alcohol or using drugs
- Focus on the job at hand
- Be aware of the movement of others
- Keep a safe distance between yourself and others when using tools or chemicals
- Know where the fire extinguisher and First Aid Kit are located
- Never smoke or allow anyone else to smoke in your work area

Follow the Rules:

- Read manuals and follow all safety procedures
- Wear the appropriate clothing and protective gear for the job you are doing
- Listen carefully to your instructor and follow their direction
- Follow all written instructions
- Read and follow labels and Material Safety Data Sheets (MSDS) for all products

- Be able to recognize symbols, for example:
  - Workplace Hazardous Materials Information System symbols for:

Compressed Gas

Flammable and Combustible Material

Note: WHMIS training is not part of this course. You can sign up for a WHMIS course or wait until you have the opportunity to complete the course as part of your on-the-job training.

Organize Your Work Area:

- Remove any hazards from your work area
  - Anything flammable, volatile or explosive
- Store gas cylinders in a separate, protected area
- Have a place for your tools
- Clean your work area and pick up anything that has fallen on the floor
- Return everything to its proper place when you are finished with them
- Keep all tools and materials out of the reach of children and pets
- Design your work area to be safe and efficient
- Ensure you set up your work area somewhere with good ventilation

Plan Ahead:

- Think through all of your steps before you begin
- Know where you will set hot metal to cool
- Know where you will set your torch

CLOTHING

Reading Text, Document Use

Thinking Skills: Decision Making

This section lists the gear you will need for jewellery making. This gear should be worn when you are working on your project or watching a demonstration.

Clothing:

- Select heat and fire resistant clothing that will protect you from high temperatures, sparks and flames
    - Choose clothing made of tightly woven natural fibers
    - Leather, cotton or wool are good choices because natural fibers are flame resistant; synthetic fabric such as nylon can melt to your skin
- Wear long pants that cover the tops of your shoes or boots
- Wear long sleeved shirts
    - Tuck your shirt into your pants
- Avoid synthetic shoes, because they can melt
- Remove anything flammable from your clothing
    - Remove things such as lighters and matches from your pockets
- Avoid wearing anything that could trap hot metal or sparks
    - For example, avoid cuffs, open neck shirts and baggy pockets
- Wear old clothes in case your clothes are damaged
    - However, don't wear anything baggy or frayed
    - Save money by shopping at secondhand clothing stores
- Remove rings or jewellery before you begin

Safety Equipment:

- Wear approved safety glasses or safety goggles to protect your eyes
    - You can buy CSA prescription safety glasses
- Wear leather work gloves
    - Check your gloves for damage before you begin
    - Select light, unlined gloves

SAFETY- JEWELLERY MAKING

Reading Text, Document Use, Oral Communication

Thinking Skills: Critical Thinking

The following section will introduce safety tips specific to jewellery making. Topics will include ergonomics, protecting others, the safe use of equipment, safe use of compressed gas, and solder safety.

Ergonomics

Whether you are at work or at home it is important to assess your activities to make sure they are correct for you ergonomically. For example, assess your body position as you work to make sure you are in the most comfortable position.

Jewellery makers do detailed work that requires them to stay in one position for long periods of time. This puts them at risk of muscle strain (arms, neck and back) and eye strain. Over the years this could lead to an injury.

As you work, pay close attention to how you feel physically after you have completed a jewellery making task. If you identify something as a potential problem, you can make changes before it leads to an injury. This means you will be able to continue working on jewellery making projects long into the future.

It is also important to note that if you are comfortable in your work, you will also be more productive.

Ergonomics: the study of how workspaces and equipment can be designed to be efficient, safe and productive. This includes adjusting the positions of the worker, the tools and the equipment. Matching the work to the worker will improve both comfort and safety.

Protect Your Muscles and Joints:

- Adjust the position of your work table so it's comfortable for you
- Have things positioned so you don't need to reach for them
- Stretch before you begin working
- Find the most comfortable position
    - Sit on a stool whenever possible
    - Your body should be well supported
- Find a stable, comfortable position if you must stand
    - If possible, lift one foot onto a stand, keep your back straight, keep your feet apart, with one foot in front of the other
- Keep your elbows close to your body and support your arms
- Place items you are working on at waist or elbow level
    - Just below elbow level if you are sitting
- Hold tools properly
- Take breaks and stretch
- Try to work somewhere that is quiet or free of distractions
- Ensure the temperature of your work area is comfortable
- Ensure that you have good lighting

Protecting Others

- Keep a safe distance between yourself and others when you are using equipment
- Keep things off the floor, including cords so others don't trip

- Let people know when metal and tools are hot
    - Never walk away from hot metal in case someone tries to move it
- Clean up whenever you have finished working

Safe Use of Equipment

Handle Tools and Equipment Safely:

- Talk to your instructor before using any tools or equipment
- Read manuals and safety guidelines before you begin
- Follow all manufacturers' safety guidelines
- Wear all recommended safety equipment and clothing for the job
- Tie your hair back and remove jewellery (e.g. rings and necklaces)
- Check that the equipment is in good repair and properly installed
- Ensure that your work area is tidy before you begin
- Ensure that there is space between your work and any gas cylinders
- Confirm that the gas cylinder is connected properly (your instructor will connect the gas for you)
- Safely store or hang up tools when you are finished

Power Cord Safety Tips:

- Check power cords for burns and report any damage to your instructor
- Inform the instructor if you burn a cord
- Never leave cords near heat
- Never twist, tie or tangle power cords

- Keep power cords clear of other tools
- Do not drape cords across any part of your body
- Carry tools by the handle only
- Switch off all tools before connecting them to a power supply
- Plug into the nearest power supply and check that the cord does not lay across the floor where other people will be walking
- Pull cords by the plug rather than the cord when unplugging equipment from an outlet
- Unplug tools before working on them, adjusting them or setting them up
- Turn off power and unplug any equipment you are not using

Safe Use of Compressed Gas

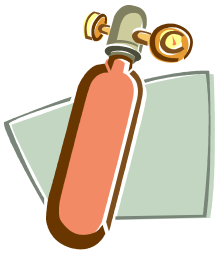
Jewellery makers often use pressurized oxygen and fuel gasses such as acetylene. It is critical that you learn how to use these gases safely. Improper use can result in asphyxiation, fire, explosions and poisoning.

Note: In this course you won't need to set up pressurized cylinders, your instructor will do that for you. The following section is just for your general information. It outlines steps you can take to stay safe. However, the manufacturers' instructions and direction from your instructor must always take priority.

<u>General Safe Handling Guidelines – Pressurized Cylinders:</u>

- Follow all guidelines
- Check that the gas, cylinder and attachments are right for the job
- Check that everything is in good working order
- Check that hoses are clear and tangle free - no kinks

- Check that you have enough gas in the cylinder to finish the job you are working on
- Protect cylinders from the torch flame
- Never attach anything to or hang anything over the cylinder
- Protect the cylinder from extreme temperatures and harsh weather conditions
- Protect the cylinder from contact with oil and grease
- Mark empty tanks



Moving Cylinders:

- Ask for help moving a cylinder
    - Never drag a cylinder or lay it on its side to roll it
    - Protect cylinders from sudden movements or impacts
- Attach the cylinder to a hand cart
    - If necessary you can tip the cylinder and roll it
        - Keeping the cylinder upright, place one hand on the cylinder cap and one on the shoulder of the cylinder
        - Never lift with the valve

Acetylene and Oxygen:

It is possible that you will be exposed to acetylene and oxygen when you are soldering. These gases are all stored in pressurized cylinders so follow all safety guidelines and work with your instructor.

Acetylene is a highly flammable hydrocarbon gas. It is mixed with oxygen to produce a high temperature flame. It can burn at temperatures as high as 3,087º Celsius (5,589º Fahrenheit).

Acetylene is lighter than air and it is colourless. It needs to be handled with extreme caution.

Oxygen is a colorless, odorless gas that is necessary for combustion to take place.

Using Acetylene - General Tips:

- Follow all manufacturers' guidelines
- Ensure that there are no flammables in the work area
- Wear proper safety gear
- Stand to the side when you open a tank valve
- Light the flame using an approved striker
    - Do not use a match
- Always point the tip away from your body
- Never direct the flame toward anything other than the metal you are working on
- Never walk around with the torch
- Never leave a torch unattended until it has been turned off, the flame is out and it has cooled
- Hang up the torch when you are finished
- Neatly coil the cables

Flashback: burning of gases inside the torch body or hoses. You will hear a loud hiss or squeal. Shut off immediately; find the cause and fix it before you continue working.

Backfire: a loud pop caused by flames backing up into the tip of a torch. It's caused by overheating the tip (working too close to metal with low gas pressure). Shut off immediately; find the cause and fix it before you contiue working.

Additional Tips for Using Acetylene and Oxygen:

- Follow the manufacturers' recommendations for the correct pressure and tip size
- Open the valve on the acetylene cylinder no more than ¾-1 ½ turns so it can be closed quickly in case of emergency
    - Open the valve on the oxygen tank fully
- Leave the valve wrench in position on the acetylene cylinder as you work
- Check your pressure gauge before you begin
    - Never use acetylene at a pressure over 103 kPa (15 psig) because high pressure can lead to explosions
- Adjust the regulators to the correct pressure for the job
- Check that the reverse flow-check valves and flash arrestors are installed on the oxygen and acetylene lines
- Light acetylene first, the oxygen second
    - **"A" before "O" or up you go!**

Some terms you may hear:

psi: pound per square inch or pound-force per square inch. The unit of pressure (one pound of force) on an area of one square inch.

kPa: pascal is the SI (metric) unit of pressure.

1 psi = 6.9 kPa

psig: pound-force per square inch gauge. A unit of pressure relative to the surrounding atmosphere at sea level.

The earths atmosphere exerts a pressure of 14.7 psi at sea level.

psia: pounds per square inch absolute. If you have 20 psi you need to add 14.7 to get the absolutte psi.

psi + 14.7 psi = 34.696 psia

- Follow proper shut down procedures
    - Shut off the oxygen first, then the acetylene
    - Close cylinder valves
    - Relieve any pressure from hoses
- Remove regulators and replace protective caps before moving cylinders
- Store oxygen cylinders away from acetylene cylinders

Soldering Safety

- Set up a separate area for soldering
- Have a ceramic block or charcoal block available to work on
- Select solders that do not contain cadmium or lead
- Avoid breathing solder fumes
- Make sure your work area is well ventilated or wear a respirator
- Clean your work area, removing anything flammable before you light the torch
- Wear goggles
- Never touch any area that has been recently soldered
- Never touch any solder that drips off your work

WORKING WITH CHEMICALS

Reading Text, Document Use

Thinking Skills: Critical Thinking, Decision Making

Although the chemicals you will be using to complete your jewellery making project are not dangerous, they are considered toxic and corrosive so it is important to work with caution.

The following section lists the chemicals you may be using, followed by some specific safety tips. This includes Pickle, Flux, Liver of Sulfur and polishing compounds.

Material Safety Data Sheets: "The purpose of a Material Safety Data Sheet (MSDS) is to inform industrial purchasers and users of hazardous chemicals of the reasonably foreseeable physical and chemical hazards that may arise from the use of those chemicals. Most materials packaged for consumer use are exempt from the requirements of the Hazard Communication Standard (HCS). The MSDS should include precautions for normal use, handling, storage, disposal, and spill cleanup." *http://www.meridianeng.com/msds.html*

General Tips

It is important that you read labels and the Material Safety Data Sheets (MSDS) for any chemical you use in class, at work or in your home. You will find MSDS sheets in all workplaces that use chemicals.

Whenever you are using chemicals remember that they can be absorbed through your skin, eyes and mouth. It is important that you wear gloves, wash your hands regularly, keep your hands away from your face, and try not to rub your eyes or mouth. Please watch for any skin irritations.

Before you begin cover all cuts and scratches with a bandage. It is important that you avoid eating and smoking while you are working with chemicals.

Note: Children under 12 or pregnant women should not be exposed to solder or jewellery making chemicals.

Pickle

Pickle is a mixture of water and a commercial acid. It will remove contaminants, flux and oxides from the surface of your metal. You can use sulfuric acid (strong water soluble mineral acid), nitric acid (a highly corrosive and toxic strong acid) or sodium bisulphate (dry acid). In this class we recommend that you use sodium bisulfate because it is the safest acid solution. You will learn more about pickle later in your Student Notes.

Tips for using Pickle:

- Add water to the container first, then add the acid
    - **If you add the acid first, adding water will cause an explosion**
    - You can remember the order by thinking "water is the largest quantity so add it first"
- Wear goggles, gloves and an apron to protect yourself from acid burns to your skin and clothing
- Keep the pickle warm
    - Most jewellery makers use a crock-pot
    - At home, label your crock-pot so it is never accidentally used for food

- Avoid breathing the fumes from the pickle, it can irritate your lungs
- Keep a lid on the heated pickle
- Place items into the pickle gently
    - If you drop your piece into the pickle it can cause the acid to splash
- Rinse your skin immediately with soap and water if you touch or splash the pickle solution
    - If acid splashes on your eyes rinse them for 15 minutes, and have them checked by a doctor
- Store the pickle away from any other chemicals such as flux
- Clearly label all storage containers
    - In your home workshop, it is important that you label any container you use for jewellery making

Silicosis: a lung disease caused by prolonged inhalation of dust containing silica and marked by the development of fibrous tissue in the lungs and a resultant chronic shortness of breath.

Silica: silicon dioxide found naturally in various crystalline and amorphous forms, e.g. quartz, opal, sand, flint, and agate. Use: manufacture of glass, abrasives, concrete.

Liver of Sulfur

Liver of Sulfur is the name given to potassium sulfide. It can be used to darken the surface of silver.

The fumes from Liver of Sulfur can be dangerous so you need to work in a well ventilated area or wear a respirator. Keep the container covered.

Keep Liver of Sulfur away from the pickle solution. If it comes in contact with an acid, toxic fumes can develop. Remove any traces of the pickle from your jewellery piece before you dip it in the Liver of Sulfur.

It is also recommended that you wear gloves.

Polishing Compounds

- Some polishing compounds contain free silica so work in a well ventilated area
- Wear a dust mask
- Wet sand whenever possible
    - Wet sanding will help to keep the dust down

Note: If you are using a polishing machine:

- Tie your hair back
- Avoid wearing anything that could get caught in the machine (jewellery)
- Keep your hands away from the spinning disks

CLEAN UP

Document Use

You will be responsible for cleaning up your work area as you go. You will also be responsible for cleaning your work area at the end of each class.

Cleaning:

- Use a brush to clean off your piece and your work area
    - Never blow on metal filings or brush off metal with your hand, this can result in painful metal slivers in your eyes and skin
- Keep your work area clean and free of anything flammable
- Clean your work area before leaving at the end of the class
- Use water to dampen surfaces before you dust, mop or clean
    - Water will help control any toxic dust
- Use the garbage and recycle bins for the appropriate items

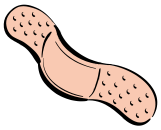
Respecting the Environment:

- Keep baking soda (sodium bicarbonate) beside your pickle
    - Baking soda will neutralize acid so it can be used to clean up spills
- Add baking soda to the pickle solution before throwing it out
    - The baking soda will make the solution bubble
    - When it stops bubbling, place it in a well marked container and take it to a hazardous waste facility

- Store chemicals safely when you are finished with them
- Plan before you start to work; this will help eliminate waste
- Save small pieces of silver so that others can use them on their projects
- Use newspaper or a cloth for clean up rather than paper towel
- Recycle cans and glass bottles

AVOIDING INJURIES – SUMMARY CHART

Document Use

INJURY	CAUSE	AVOIDING
Cuts 	Saws and sharp metal	• Handle metal with caution • Wear work gloves • Wear safety goggles • Keep your work area clean
Burns 	Torch, melted solder and hot metal	• Follow all instructions for using a torch • Handle the torch and solder with caution • Wear long pants and covered shoes • Focus on the task at hand • Never pick up metal with your bare hands
Breathing fumes 	Solder and chemicals including heated pickle	• Work in a ventilated area or wear a respirator • Keep your face away from fumes
Absorbing chemicals through skin, eyes, mouth 	Chemical Exposure Including pickle, flux, polishing compounds, Liver of Sulfur	• Follow the directions on labels and MSDS • Wash your hands after using chemicals • Keep your hands away from your face • Do not rub your eyes or mouth • Do not eat or smoke while working • Wear gloves • Wash jewellery at various stages in the process

JEWELLERY MAKING

HISTORY OF JEWELLERY MAKING

Reading Text, Document Use

Jewellery is defined as "an item of personal adornment". (Wikipedia) This can include things like necklaces, rings, or bracelets.

Traditionally, jewellery has been made with metals, gemstones and natural materials. The same materials are used in modern jewellery making, in addition to glass and plastic.

Jewellery making has a very long history. It has been confirmed that people have been wearing jewellery since prehistoric times. Archeologists have discovered shells, bones, stones and animal teeth that had been used in jewellery making as far back as the Stone Age. For example, shells with holes for linking them together have been found in caves. Testing confirmed that these shells were worn over 75,000 years ago.

"Jewelry" is the American spelling and "Jewellery" is the British/Canadian spelling.

If you are searching the internet "Jewelry" may be the more common spelling.

For more information about the history of jewellery, try searching the internet for "history of jewellery or jewelry."

It seems that humans have always worn jewellery; however the styles and meaning of the jewellery has changed. Jewellery has also been found in every culture. Therefore by studying the history of jewellery a lot can be learned about customs, traditions and beliefs of past civilizations. It also provides insight into human behaviour.

When people first started studying human civilization they tracked the development of tools and weapons; this resulted in three ages being identified; the Stone Age, Bronze Age and the Iron Age. Jewellery making has also been studied during these same three time periods.

Stone Age: The term Stone Age, refers to a prehistoric time starting 2.5 million years ago when humans used stones for making tools and weapons. During this time jewellery was made with natural materials such as shells and stones.

Bronze Age: The Bronze Age from 3,300 to 1,200 BC followed the Stone Age. It was a time period when humans learned to melt and combine copper and tin to produce bronze. Bronze was used for making functional and decorative things including jewellery. During this time jewellery makers also started using glass beads and gems.

The Iron Age: The Iron Age dates from 1,200 to 550 BC. This is the age when iron was used for weapons and tools. During this time gold, silver, bronze, iron, and electrum (a mix of gold and silver) were used in jewellery making in addition to coloured glass. Torcs (metal collars or armbands) and bracelets were popular during this time. In most cases only the rich had access to jewellery.

Recent History: By the 1600's jewellery making was considered more of an art form. Access to jewellery continued to be limited to those with money, power and position.

If you search the internet for "iron age jewellery" or "bronze age jewellery" you will find sites that provide both information and pictures.

In the 1900's, industrialization allowed for the production of inexpensive, factory produced jewellery. Mass produced jewellery made it affordable for the lower and middle class.

The Impact of Jewellery

Jewellery has shaped our history in many ways. For example, gold and diamonds were scarce and expensive to mine which increased their value; their value made them worth searching out. The search for gold and diamonds had an impact on immigration and population movement. For example, the gold rush saw the development of small settlements that later became towns.

The value of the raw materials used in jewellery making has also had an impact on the economies of the world. For example, many cultures kept a portion of their wealth in the form of jewellery. In the past, jewellery was also used as currency. Today precious metals such as gold and silver continue to be traded on commodity markets.

Today, supply and mining costs still affect the value of jewellery. For example, gold and platinum are not as plentiful as silver and the mining costs are higher, therefore silver is less expensive to buy. Supply and mining costs also keep the cost high for diamonds, rubies, emeralds and sapphires.

If a metal is rare it is called a precious metal.

Precious metals in bulk form are known as bullion.

Value

Throughout history jewellery has been valued for reasons other than the actual cost for the raw materials.

- Jewellery was valued for its practical uses
    - Pins and broaches were used to keep clothing closed
- Jewellery has been used to identify military rank, social status, wealth, religion and group membership
    - E.g. the iron ring worn by engineers
- Some jewellery is symbolic
    - E.g. Crucifix, Star of David and wedding rings
- Jewellery has been valued for the protection it offers from evil forces
    - Amulets
- Jewellery is valued for its craftsmanship/artistry

Trends

Over time there have been shifts in:

- who wears jewellery
    - Men and/or women and children
- what is worn
    - In ancient Egypt men wore crowns, rings and armbands to show their status and power and women wore stones and gems
- where it is worn
    - Piercing has changed, for example, tongues are now pierced
- the size, shape and design of the jewellery
    - Moving between large, heavy jewellery to small and intricate designs
- the message a piece of jewellery sends
    - Jewellery is often used to show personality, personal style and mood

Today

As mentioned, the growth of factories allowed for the mass production of jewellery. This meant that in the early 1900's it was finally affordable for the average person. This resulted in a whole new market and an increase in the popularity of jewellery. However, at the same time access to factory produced products undermined the value of handcrafted jewellery.

Mass produced jewellery made from cheaper materials such as plastic and glass are still popular today, however, since the 1960's there has been a trend back to handcrafted jewellery.

Today, jewellery makers who make individual handcrafted pieces continue to use precious metals such as gold, silver and platinum. They also use semi-precious metals and alloys including bronze, white gold, palladium and titanium.

Precious gems are still used in jewellery making including diamonds, amethyst, emerald, jade, jasper, quartz, ruby, sapphire and turquoise as well as natural materials such as pearls, coral and amber. Jewellery is also made from glass, enamel, wood, clay, shells, bone and plastic.

Jewellery makers and designers use shapes, designs and colours to make the jewellery unique.

Note: Some of the jewellery making techniques used today can be traced back 5,000 years.

METAL

Reading Text, Document Use

Thinking Skills: Decision Making

It's important for jewellery makers to have a basic understanding of metals.

Metal is a class of chemical element. As a general rule, metal:

- can be described as having ductility – (e.g. can be hammered into thin sheets or drawn into wire)
- can be described as having malleability – (can be shaped or bent without breaking or cracking)
- is solid at room temperature (except mercury)
- can be melted or fused
- is opaque (light can't go through it)
- can reflect light when polished
- conducts electricity and heat
- can be combined with other metals to create an alloy

If you decide that you want to continue making jewellery you will need to know the advantages and disadvantages of the different metals. This knowledge will help you choose the best metal for each specific piece of jewellery you make.

Platinum, silver and gold are precious metals often used in jewellery making. All three are good choices for jewellery because they are chemically stable, strong and attractive.

Silver and gold are better known because they have been used by jewellery makers for years. Platinum is not used as often because it is more expensive, heavier, harder to find and harder to work with than either gold or silver. However, platinum jewellery became popular within the hip-hop culture.

Base metals are metals such as copper, nickel, aluminum, zinc and tin. These metals are more plentiful than precious metals and less expensive, however they are not as durable and they are known to tarnish quickly.

Silver

In this course you will be working with silver. Silver is a good metal for jewellery making because it is less expensive than gold while still being attractive and easy to work with.

Silver is soft and very malleable; however it is actually too soft to use. For silver to have any practical use it must be combined with another metal. Copper is the metal used most often. The resulting alloy is called sterling silver. In most cases sterling silver is 92.5% silver and 7.5% copper. Copper adds strength, hardness, durability and resistance to the silver, while still leaving it soft enough to work. It is also ideal because it doesn't change the colour or shine of the silver.

Alloy: a mixture of metals or a mix of metals and non-metallic substances.

Pure silver melts at 960 degrees Celsius (1,760 Fahrenheit.

Sterling silver melts at 893 degrees Celsius (1,639 Fahrenheit)

Millesimal fineness: a system of identifying the purity of platinum, gold and silver alloys by parts per thousand of pure metal in the alloy."

http://www.absoluteastronomy.com/topics/Millesimal_fineness

When you are buying silver make sure it contains 92.5% silver. You may see 925 stamped on jewellery you buy. This number identifies its millesimal fineness. The 925 stamp means that the silver contains 92.5% silver. Other silver percentages including:

- 999 (Fine silver used in bullion bars, also known as three nines fine)
- 958 (equivalent to Britannia Silver)
- 950 (equivalent to "French 1st Standard")
- 925 (equivalent to Sterling Silver)
- 900 (equivalent to "Coin Silver" in the USA, also known as one nine fine)

Copper

In this course you may have the opportunity to use copper. As mentioned, copper is a base metal that is soft and easy to work. It is ideal if you want to add textures and designs.

Copper is less expensive than precious metals because it is plentiful and easier to mine. This makes it affordable for jewellery makers.

Copper is often described as being a warm colour. It starts off a pinkish colour but it turns a red/brown/orange colour. Most metals are gray or silver, so the colour of copper makes it unique. It is important to think about the colour of the metal you are using when you are selecting beads to include in your jewellery. For example, some colours will clash with copper.

Copper is also ductile, so it is a good choice for making wire. It is also well known for its ability to conduct heat and electricity which is why it's used for electrical wiring.

Copper can be strengthened by combining it with other metals. When metals are combined the end result is called an alloy. As mentioned, when copper is combined with tin it creates the alloy bronze. When copper is combined with zinc the resulting alloy is brass.

HEATING METAL

Reading Text, Document Use, Numeracy

Thinking Skills: Decision Making

Annealing

If you were to look at a piece of metal under a microscope, you would see that it is made up of a series of crystal structures. When metal is heated and melted, the arrangement of these crystals will change. When the metal cools the crystals won't line up in the same orderly fashion. This change in structure will cause the metal to become harder.

Additionally, each time the metal is worked (stretched, flattened, hammered and shaped) the crystals are compressed. This also causes the metal to become harder and less flexible, which makes it difficult to work.

You can restore most of the metal's original qualities (soft, workable, malleable and ductile) using a process called annealing. If you heat the metal to its annealing temperature and then cool it using a specific technique, the crystals will line up in an orderly fashion.

Note: It is very important that you apply the correct annealing process (temperature and cooling method), for the metal you are using.

Annealing Silver

Ideally you will place your silver piece on a ceramic or charcoal soldering block before you begin the annealing process. A soldering block makes it easier to heat the whole piece to the correct temperature.

Note: Charcoal reduces oxygen and the dark colour makes the silver easier to see.

In this class you will use an acetylene torch to provide the heat.

To anneal sterling silver the entire piece needs to reach a temperature between 593º and 649º Celsius (1100º and 1200º Fahrenheit). When your piece has reached this annealing temperature for a few seconds, remove the heat source. You must work carefully and quickly.

You can't measure the temperature of the metal so you need to rely on other clues to let you know when you have reached the right annealing temperature. For example:

- Dip your piece of jewellery in a flux solution before you heat it. Watch carefully because the flux will become shiny when the silver has reached the annealing temperature. (Flux will be covered in detail later in your Student Notes)
- You can also gauge the temperature of silver by watching the metal for colour changes. Sterling silver will become a brown/red to dark red colour when it reaches the correct annealing temperature. You may want to lower the lights so it's easier to see the colour changes.

Note: It is very important that you don't overheat your piece. Overheating will cause it to become even harder and impossible to work.

Quenching

After the annealing temperature has been reached, some metal can be left to air cooled; however sterling silver needs to be quenched in water. Once you remove the heat source, watch the metal until it is no longer red and then pick it up with tongs and dip it into a container of water. Leave the piece in the water until it has cooled.

Note: Only use water. Other liquids may cause toxic fumes.

Annealing Copper

Copper starts out very soft, so some hardening may be a good thing. However, you don't want it to become brittle. To anneal copper follow the same steps you would use to anneal silver.

Fire Scale (Fire Stain)

As mentioned, copper is used to create the alloy sterling silver. When you solder or anneal silver, the heat allows oxygen to be absorbed. The oxygen will react with the copper causing oxidation on or below the surface. A purple/red/black stain forms on the silver when the copper oxidizes. This is called fire scale or fire stain.

In most cases jewellery makers want to avoid fire stain because it takes away from the look of the piece. Fire stain will also cause the piece to tarnish quickly over time. To protect your piece from oxygen when it's heated you can coat it with flux. The flux will act as a barrier to oxygen.

If you do see fire scale on your piece you can remove the stain by using a process called pickling. (Pickle is covered in detail later in your Student Notes.) You may also be able to remove deeper stains by filing, sanding or polishing your piece with an abrasive compound. This is a time consuming process and may remove some of the detail.

Colour and Temperature Chart:

As mentioned, heating metal causes a temporary colour change. The colour changes reverse as the metal cools.

	°C	°F
Black	426	>800
red	500	932
brown red	550	1022
dark red	680	1256
cherry	*800*	*1472*
light red	*900*	*1652*
orange	*1000*	*1832*
yellow	*1100*	*2012*
pale yellow	*1200*	*2192*
white	*1400*	*2552*

Note: This chart has been included as a reference point only. The colours and temperature ratings may vary depending on the metal you are using.

CHEMICALS

Reading Text, Document Use

Flux

Most flux is made of borax, which is an ore of boron (a metalloid element). As mentioned, flux is a chemical that can protect your silver piece from oxygen when it's being heated. Flux can also help you gauge the temperature of the silver because it becomes shiny when it reaches the annealing temperature of 593º to 649º Celsius (1100º to 1200º Fahrenheit). Flux will also help to keep the silver clean and make solder flow smoothly.

There are different ways to apply flux; you can paint it on, spray it on or you can dip your metal piece in the liquid solution. In this course we recommend that you dip your jewellery piece in a container of liquid flux using tweezers. You can also paint it on with a small paint brush. As a general rule, it is best to avoid spraying chemicals.

Heated flux works best. You can heat flux in a heat resistant container placed on a hot plate.

Tweezers: a metal tool made from two narrow, slightly curved arms, joined at one end. They are used for picking up and holding small objects.

Self pickling flux: a type of flux that also cleans the metal.

<u>Tips for Using Flux:</u>

- Have a container of flux near your soldering block
    - Keep your flux warm, unless it is self pickling flux
- Dip your piece in the flux before soldering
    - Use tweezers
    - Reapply flux every time you heat your piece

If you are using self pickling flux:

- Pour a small amount of flux into the lid of a container
- Dip the piece into the flux or paint it on

Copper will oxidize quicker than silver so it is even more important that you use flux.

Tongs: Two hinged or sprung arms that press together in a pinching movement around the object you are lifting.

Note: Sodium bisulfite is not the same as sodium bisulfate.

Pickle

Pickle is an acid solution used to clean metal. It will remove surface impurities, flux and fire scale from the surface of your silver. Your piece should be placed in the pickle bath after soldering or annealing. Five minutes is usually long enough to clean most pieces.

Pickle is a mixture of water and a commercial acid. You can use sulfuric acid (strong water soluble mineral acid), nitric acid (a highly corrosive and toxic strong acid) or sodium bisulphate (dry acid). In this class we recommend that you use sodium bisulfate because it is the safest acid solution.

Note: If the acid you use needs to be diluted with water, check the ratio listed on the product label. For example, it may say to mix 1 part acid to 9 parts water. You will need to follow the mixing directions carefully. Only use cold water and work in a well ventilated area. **Always remember to add the water first; otherwise you will cause an explosion.**

Acid solutions will work best when they are heated to about 52 degrees Celsius (125 degrees Fahrenheit). Most jewellery makers use a crock-pot to keep the pickle solution warm. If you use another type of container, make sure it is acid and heat resistant. Your container also needs a lid. Whatever heat source you use, make sure it will keep the solution at a constant temperature.

Note:

- Label any container you use for jewellery making
    - For example, label your crock-pot so it is never accidentally used for food
- Never put stainless steel in the pickle, it will contaminate the solution, which will then contaminate your jewellery
    - Use copper or brass tongs to add or remove items from the pickle
    - You can also use a wire basket to raise and lower your jewellery into the pickle
- Never put silver-plated items in the pickle

Tips for Using a Pickle Solution:

- Follow the instructions, read the label and the Material Safety Data Sheet
- Wear goggles to protect your eyes
- Wear an apron to protect your clothing
    - Pickle can bleach and/or burn holes in your clothes
- Wear gloves to keep from getting the pickle on your hands
- Wash your hands with soap and water after using the pickle
- Fill a container with water first, then add the acid
- Keep the pickle warm, but never allow it to boil
- Keep a lid on the pickle
- Cool items before placing them in the pickle
- Use copper or brass tongs to add and remove your jewellery from the pickle
- Place items carefully in the pickle
    - Dropping things into the solution will cause it to splash up
- Set the timer for five minutes
- Remove and wash the piece

Note: As mentioned in the safety section, baking soda will neutralize acid, so keep some handy in your work area. It works well for cleaning up spills. It will also neutralize the pickle solution when it is time to throw it out.

Note:
Potassium sulfide is not the same as potassium sulfite.

Liver of Sulfur

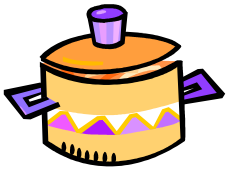
Liver of Sulfur is the name given to potassium sulfide. It is a chemical, so work with caution.

Liver of Sulfur is used to darken the surface of silver jewellery. It gives your finished piece an antiqued look; it can also be used to make a texture or pattern stand out.

When your piece is done, place it into a solution of Liver of Sulfur until it is coated. When you remove the piece you will need to rinse it, dry it off, and then polish it. As you polish the piece, the black is removed, except for the hard to reach places around the edges and in the corners of the pattern.

Tips for using Liver of Sulfur

- Follow manufacturers' instructions and read the Material Safety Data Sheet
- nsure you have good ventilation
- Keep the solution covered when you are not using it



- Keep Liver of Sulfur away from all acids
    - Contact with your pickle solution can result in toxic fumes so do not mix it or store it near the pickle
- Buy Liver of Sulfur in lumps rather than powder
- Mix up a small amount at a time
    - Dissolve a small pea size piece in a cup of warm water

Note: Wash your piece to remove any pickle before you put it in the Liver of Sulfur.

SOLDER

Reading Text, Document Use, Numeracy

Thinking Skills: Decision Making

Solder is a metal alloy that can be used to permanently join two metals. When the solder is melted it flows into openings and down between two metals that have been placed side-by-side. When it cools it hardens, joining the two pieces together.

Do not use solder that containes lead when making jewellery.

The melting point of "soft solder" is too low for jewellery making; it is designed for projects such as stained glass. If you use soft solder your piece will not be strong enough to last.

There are many types of solder alloys to choose from when you are making jewellery. In this course you will be using silver solder. Silver solder will blend with your jewellery so the seams won't be visible. Silver solder can also be used for soldering brass and copper jewellery.

Silver solder is an alloy of silver, copper and occasionally zinc. Silver solder is made with different melting points. In this class you will have the choice of using hard, medium or easy solder. Easy silver solder melts at a lower temperature than hard solder.

Different melting points are important in jewellery making because you may need to solder the same piece of jewellery several times. If you need to heat your piece more than once, you will need to start with solder that has the highest melting temperature. The second time you apply solder you will need to use solder with a lower melting point. This way, you don't need to worry about your first solder join melting and letting go when you are soldering the second piece.

Solder also melts at a lower temperature than sterling silver. This lower melting point is important; otherwise your jewellery would melt away while it was being soldered.

Approximate Melting Points:

- Sterling Silver - 893° Celsius (1639° Fahrenheit)
- Hard Silver Solder – 774° Celsius (1425° Fahrenheit)
- Medium Silver Solder – 754° Celsius (1390° Fahrenheit)
- Easy Silver Solder – 718° Celsius (1325° Fahrenheit)

You can buy solder in sticks, wire or sheets. In this course you will use solder that comes in sheets. The sheets are very thin and narrow. They will be approximately 0.3 millimetres (0.012 inches) thick and one or two inches wide.

Solder pick: a small steel tool with a sharp point used for moving solid and melted solder.

Side cutter/pliers: a hand-tool with sharp edge cutting jaws.

Use tools with wooden or insulated handles because metal will transfer heat.

Tips for Using Solder:

- Cut the sheets of silver solder into small pieces
  - Use sharp scissors or side cutters
  - Cut a variety of sizes
  - Keep your squares under 4 millimetres (0.16 inches)
  - Cut only what you need
- Place your cut solder pieces on a flat surface, arranged by size
  - You will also need to keep hard, medium and easy solder separate
- Estimate the number of times you will need to solder the piece
  - This will help you select which solder to start with (e.g. hard, medium or easy)
- Pick up a solder piece with tweezers and place it on your piece of jewellery
  - Select the right size piece for the area you need to solder

- Continue placing solder everywhere you want a join
- Use a solder pick to move solder into place
    - A solder pick can also be used to move melted solder because it won't stick to the pick
- Store unused solder in well marked containers

SOLDERING

Reading Text, Document Use, Numeracy, Oral Communication

Thinking Skills: Critical Thinking

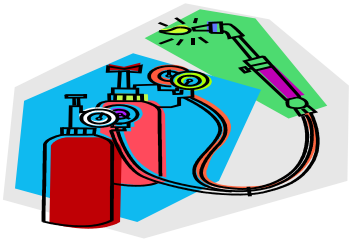
The word soldering comes from the Latin word "solidare" which means to make solid. Soldering involves heating pieces of solder until they melt. The melted solder flows between the two pieces of metal you want to join permanently. Unlike welding, soldering will not melt the metal being joined.

In this course you will be using an acetylene torch to melt the solder. Acetylene uses the combustion of acetylene and oxygen to produce a flame up to 3,482° Celsius (6,300° Fahrenheit), hot enough to preheat metal to 871° Celsius (1,600° Fahrenheit). As you know, hard solder will melt at 774° Celsius (1,425° Fahrenheit). This means a direct, continuous flame, turned to its hottest setting, will be more than you need. As mentioned, the temperature you need will depend on the type of solder you are using.

It is important to work carefully so you don't burn a hole through your silver piece. It can't be repaired.

In addition to your torch (for melting solder), tweezers (for placing solder) and a solder pick (for moving or guiding solder), you will need a surface to work on. The piece you will be soldering needs to rest on something called a soldering block. This surface must be heat resistant. Both ceramic and charcoal make ideal soldering blocks.

Note: Charcoal absorbs oxygen from the air, which can help you avoid oxidization.



Tips for Preparing to Solder

- Work safely, following all safety steps outlined in the safety section of your notes
- Work with your instructor
- Check that your piece is ready to be soldered before you light your torch
    - Ensure the pieces line up and fit together well
    - Check that there is nothing flammable around your work area
    - Let people around you know you are about to begin
- Check that your work area is set up
    - Do you have a soldering block?
    - Do you have enough solder pieces cut?
- Place the piece you are working on in the pickle solution
    - This will clean the silver, by removing any dirt or grease (including greases from your hands)
- Remove the piece from the pickle and wash it
- Dip it in flux
- Place your piece on the soldering block
- Pick up solder with tweezers

Cross Lock Tweezers: are tweezers that have self locking jaws. Once you pick up a piece, they will remain closed until you release them.

Pumice: a light porous rock formed from solidified lava.

- Place the solder on the piece where you want to create a joint
    - This is called pre loading solder
    - Use as many pieces as you think you will need – it is really a trial and error process
    - You usually need less than you think
    - Ask your instructor for their opinion
- Light your torch
    - Remember to use a striker, not matches

Note: Before you begin, ensure you know where you will place your torch once it has been turned off. Work quickly but safely.

Note: If you need to balance your piece use cross lock tweezers or something like a pumice stone to hold the piece in the right position.

Tips for Soldering

- Start with a low flame and increase it as the metal begins to heat
- Keep the torch flame at about ½ the maximum setting
- Use the middle of the flame
- Keep the flame moving around your piece using a circular motion
    - For the solder to flow well, the metal around the solder needs to be heated, if you just heat the solder it will form a ball
    - Heat the whole piece gently and evenly
    - If you are trying to join two pieces, heat both equally
    - Aim the flame near, but not on the solder – solder is melted by indirect heat
        - Do not keep the flame in one place too long or your silver piece may melt

- Use the heat to direct the solder
    - The solder will flow to the hottest point
- Heat your piece slowly, letting the flux evaporate
    - If you heat the piece too fast the flux will bubble causing your solder pieces to move
    - Use tweezers or a solder pick to move solder back into position
- Watch the flux
    - When it turns clear and shiny, you are nearing the melting temperature of solder
- Watch the solder closely, it will melt quickly
    - Remove the heat as soon as the solder begins to run
    - If it turns orange, the heat is too high

FINISHING METAL

Reading Text, Document Use, Oral Communication

Thinking Skills: Decision Making, Critical Thinking

Once you have finished creating your piece of jewellery it is time for the finishing touches. The steps you take at this point will depend on the finish you want. There are many techniques you can use to create a variety of different finishes. You can choose from a polished, satin, brushed, or hammered look. In this course we recommend that you use a polished finish.

For your silver to shine you need to remove any surface marks or scratches. To get this look you need to complete several steps using a variety of techniques, tool and compounds.

Note: Clean your tools and wash your piece of jewellery with warm soapy water, then dry it after each finishing step.

You will also need to assess the piece for marks and scratches as you work. Also assess your work before moving on to the next stage.

Filing

Files are important tools in the finishing process. For example, you will need to use files to smooth the edges of any metal you cut with a jeweller's saw.

Files are hand tools that can be used for shaping or smoothing metal. Files are metal bars, with rows of sharp teeth. They come in all shapes, sizes and grades. If the file grade is 0 it will make course cuts; if the file is a 4 it will make finer cuts. Files rated 2 are a medium grade and are the most commonly used file in jewellery making. Using a 2 will allow you to remove metal, while only leaving light scratches. These scratches can be removed later by polishing.

Tips for Filing:

- Select the correct shape and grade of file for your project
    - Ask your instructor for assistance selecting a file
- Hold the metal in your hand or use a vise for larger pieces
- File away from your body
    - The teeth on a file only cut on the forward stroke
- Lift the file up as you move forward
- Use pressure on the forward stroke, just enough to cut the metal
- Use the entire length of the file
- Watch the metal carefully so that you don't file off more than necessary
- Brush the filings off the metal when you are finished
    - Never blow on metal filings or brush metal with your hand
- Clean your files when you are done
- Store files separately, they can damage each other if they are stored together

Sanding

Sandpaper is used to remove any excess solder. It is also used to smooth edges and remove any marks left from filing. Use 320 grit to start and a finer 400 grit to finish.

Tips for Sanding:

- Use aluminum oxide sandpaper of 320 or 400 grit
    - Be careful not to over sand your piece
- Wet the sandpaper by running it under water
    - If you wet sand you are less likely to breath in dust
- Place the sandpaper on a flat surface
- Hold the piece of jewellery and rub it on the paper
    - Use crisscross pattern
- Reduce the grade of sandpaper when necessary
    - Continue until there are no deep marks showing
- Assess your work throughout these steps
    - You may need to rinse your piece to see it clearly

Note: The more filing and sanding you do, the less polishing you will need to do. However, you need to be careful that you don't overdo it. You can actually remove more metal than you want or over round the edges.

Polishing

Polishing can be done by hand or by using a polishing machine. (More information about polishing machines can be found later in these Student Notes) If you are polishing by hand, you can glue a piece of suede to a paint stick. Polishing by hand may take over an hour, depending on the size of the piece you are working on.

The first stage of polishing is done using an abrasive metal polish. This stage will remove oxidation, sanding marks, scratches and pits.

The next stage of polishing is done using a fine (less abrasive) metal polish. The polishing stage will bring out the colour, brightness and shine of the silver.

Note: Polishing is also known as buffing.

Tips for Polishing:

- Start with a course compound
- Add a small amount of the compound to a piece of suede
    - You can add more later
- Finish by using a finer compound and continue until the surface is shiny
    - Use a new piece of suede when you change compounds
    - Wash with soap and water and dry with a soft cloth whenever you change compounds

If you are using a polishing machine:

- Apply compound to the cover on the polishing wheel
- Move the piece into the wheel, using light pressure

TOOLS

Reading Text, Oral Communication

Jewellery makers use a variety of tools. You will have the opportunity to use many different types of these tools in class; however, when you are starting out at home you can make some nice pieces of jewellery without buying all these tools at once. Ask your instructor what they would suggest you buy for a home workshop.

Some tools have been mentioned already in your Student Notes including:

- crock-pot
- copper/brass tongs
- wire basket
- files
- side cutters and sharp scissors
- soldering block
- solder pick
- tweezers
- acetylene torch
- flux container
- suede
- paint brush

Consumables: a product used only once. For example, in cooking, flour is a consumable; the spoon used for stirring is not.

Depending on your project you will need some specific consumables including sheets of silver, sheets of silver solder, flux, pickle, sandpaper, and polishing compound.

The following sections detail some of the other tools you will be using in class.

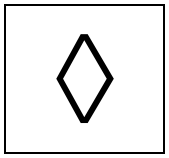
DESIGN TOOLS

Reading Text, Document Use, Oral Communication

Thinking Skills: Decision Making

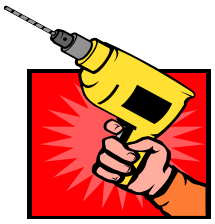
Drill and Centre Punch

If you want to cut out a pattern in a solid piece of silver, you will need some way of removing the silver from the centre of your design. For example, if the diamond in this image was part of your design, you would need to cut out the diamond while leaving the silver around it solid.



Note: You do not want your design to extend out past the edges of your silver, because it will cut the piece in half.

To cut out a design you will need to drill a hole through the centre of the diamond large enough to allow a cutting blade from a jeweller's saw to pass through. (You will find more about jeweller's saws later in this section.)



To make a hole in your silver you can use either an electric hand held drill or a large drill press. With a hand held drill, you apply pressure manually. With a drill press, the metal is clamped on the machine and a lever lowers the spinning bit into the metal. In this course you will be using a hand held drill.

Drills use drill bits to create the hole. Drill bits are thin pieces of high carbon tool steel that have grooves that spiral. Each bit has a piece of metal that sticks out at the bottom. This is designed to grip the material being cut. Bits are interchangeable so you can make any size of hole you need.

Drill bits are known to slide out of place when you are drilling smooth, flat surfaces. Therefore, it is best to begin by creating an indentation or divot in the metal with a hard metal rod called a centre punch. At one end, this metal rod will have a pointed tip and the other end will be blunt. If you place the pointed end on the metal, inside the boundary of your pattern, then hit the flat end with a hammer, you will create a divot.

Once you have a divot you can select and attached a bit to the drill. You then turn on the motor, which will cause the bit to spin. When the bit is pressed into one of the divots in the metal it will spin through the metal making the hole.

Tips for Drilling:

- Position the centre punch on your silver where you want to drill the hole
  - Create an indentation everywhere the silver needs to be removed
  - Stay inside the pattern
- Hit the punch with a hammer
- Select the right size drill bit for the job and put it in the drill
- Place the drill bit in the indentation
- Turn on the drill and apply light pressure until you have a hole in your silver
  - Continue creating holes everywhere you want the silver removed

Jeweller's Saw

As mentioned, you can cut out your design using a small hand saw called a jeweller's saw. It can be used to cut out patterns and designs in thin metal. It is ideal for fine detailed work. For example, when you are making a ring, you can use a jeweller's saw to cut out the pattern.

Image: http://www.hobbytools.com.au/prod87.htm

The blades of the saw can be purchased in many sizes, called grades. The blade you pick will depend on the metal you are cutting. For example, if you are cutting thin metal or making small cuts you will want to use a fine blade with many teeth. Thin blade sizes are marked 6/0, 5/0, 4/0, 3/0, 2/0, 1/0 to 0. For thicker metal, you can choose coarse blades that measure 1 to 6. Talk with your instructor for help selecting the right blades.

To cut out a pattern with a jeweller's saw, one end of the blade will need to be removed from the saw's frame so it can be threaded through a hole in your pattern. Once it is through the hole, you will need to reattach it to the frame before you begin cutting out the pattern.

Note: These thin blades will break easily.

Tips for Using a Jeweller's Saw:

- Work carefully, following all safety precautions
    - Keep your fingers away from the blade
- Undo the top screw to loosen the blade
- Remove one end of the blade from the saw frame
- Thread the blade through one of the holes you have drilled in the silver
- Reattach the blade to the saw frame
    - When you attach the blade, the teeth will be facing the handle
- Tighten the screw that holds the blade
    - You want the blade to be tight enough that it's rigid
- Make your cut
    - Hold the frame upright, use light pressure and a slow, smooth sawing motion
- Brace the silver against the workbench if you need support

- Move the metal rather than moving the saw
- Cut out the pattern from the inside
- Repeat these steps until you have the entire pattern cut out

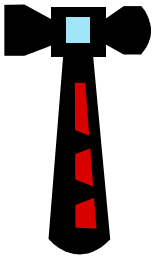
Note: You will need to use a file to smooth the edges after you have cut the metal.

SHAPING AND TEXTURING TOOLS

Reading Text, Document Use, Numeracy

Thinking Skills: Decision Making

Hammer



Hammers have many uses in jewellery making including shaping and texturing the metal. Ball Peen and Planishing Hammers are the two most common hammers used by jewellery makers. The heads of these hammers are made of hardened polished steel. They will have one flat end and one curved end.

You can shape, flatten, harden and smooth a piece of metal by hammering it against a shaped surface. This technique will also make the metal shiny.

Note: Work carefully when hammering; metal can fly off your piece.

Rawhide Hammer Mallet

Jewellery makers use rawhide hammers/mallets to strike metal when they need to flatten or shape the metal without leaving any marks. These hammers/mallets have wooden handles and a rawhide head. They are often used in the later stages of the project.

Hammer injuries are listed as one of the top five metal worker injuries. It is important to work carefully.

Punches/Stamps

Metal punches/stamps are the same shape as the centre punch described earlier; the only difference is the base. Rather than a rounded base, punches/stamps have designs or shapes at the base.

They are used the same way you use a centre punch; however instead of making a divot you are actually transferring a design onto the surface of the metal. This works well with softer metals like copper.

Ring Mandrel

Ring mandrels are used to shape and size rings. Most mandrels are cone shaped rods made out of steel. The ring sizes are marked all along the rod.

Tips for Shaping a Ring:

- Place the mandrel in a vise
- Place a flat piece of silver over the face of the mandrel
- Hammer the tips of the metal, working back and forth between the ends
    - Do not hammer the centre of the silver, only work from the ends
- Continue hammering the silver until it bends around the mandrel
    - Use swift, even taps with a rawhide mallet
    - Work carefully so you don't leave any marks on the silver
- Continue until the two end pieces line up to form the ring
- Slide the ring over the mandrel and check the size

If your ring is too small, you can use a ring mandrel to increase it half a size.

- Place the ring on the mandrel
- Hammer all around the ring with your mallet until it begins moving down the mandrel

Note: If you are making a solid bracelet/bangle, you will need to use a bracelet mandrel. Bracelet mandrels work the same as a ring mandrel only they are much larger.

Draw Plate

Draw plates are hardened steel tools used to reshape wire. You can use draw plates to reduce wire thickness/diameter and increase its length.

You can change the shape of a length of wire, by pulling it through a hole in the draw plate that is just a bit smaller in diameter than the wire. You will need to taper the end of the wire with a file so it fits into the hole you want to use. As the wire moves through the smaller hole, it will be stretched, thinned and shaped.

You can buy plates with holes that are different sizes. Each hole will be marked with its diameter. You can also buy plates with holes that will change the shape of the wire to round, square, half round and oval shapes.

Jewellery makers usually need more than one draw plate. If you have many plate options, you will be able to use one spool of wire for many different projects.

Draw plate (Wikipedia) http://en.wikipedia.org/wiki/File:Drawplates.jpg

Note: Check the draw plate before you begin to determine whether the measurements are Imperial or SI (Metric).

Note: It is important to decrease the size of the wire slowly by pulling it through smaller and smaller holes until you reach the size you want. Decrease the size by moving down one hole size each time. This usually means decreasing the diameter of the wire about 0.1 millimetre (0.004 inch) at a time.

You won't be able to pull wire through the draw plate with your hands, so you will need to use pliers or draw plate tongs. Draw plate tongs have serrated jaws that grasp the wire. They are designed to tighten down on the wire as you pull. They also have a grip at the end of the handle that will prevent your hand from slipping off as you pull.

http://store.metalliferous.com/prodinfo.asp?number=TX1390

Note: If you need to anneal the wire before you draw it through the draw plate, coil the wire first, then following the annealing steps.

Tips for Drawing Wire

- Place one end of the wire in a vise and grab the other end with pliers
- Pull the wire until it's straight
- Remove the wire from the vise
- Secure the draw plate in the vise
    - Protect the draw plate with a cloth so it's not marked by the vise
    - Do not cover any of the holes in the plate
- File one end of the wire
    - This tapered end will make it easier to fit through one of the holes
- Insert the tapered end into the hole
    - Select a hole just smaller than the wire you want to draw

- Use pliers or draw tongs to grasp the tip of the wire on the other side of the draw plate and pull it through
- Continue drawing the wire through smaller and smaller holes until you get it to the size and shape you need
    - Anneal the wire if it becomes hard and brittle from being worked – usually if the wire is drawn more than 3 times
        - Coil, anneal then straighten the wire

To learn more about different types of pliers you may want to complete an internet search.

PLIERS

Reading Text

Pliers are hand tools used to pick up and hold small pieces. They are also used for cutting and bending materials like metal.

Pliers have two levers that are joined near the jaws. They also have long handles, which work to increase the strength of your hand.

There are many types of pliers, however, in jewellery making there are five pliers that will be helpful when you are starting out.

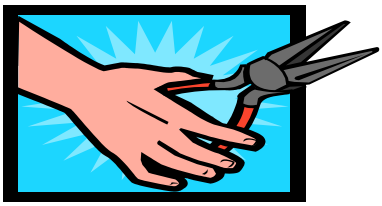
Round-nose pliers: These pliers have two round shaped jaws. They are ideal for shaping wire including making loops and chains.

Bent-nose pliers: These pliers have a bend on the end for gripping.

Chain-nose pliers: These pliers are rounded on the outside but have flat inside edges. They are designed to grip wire or jump rings and crimp and hold metal.

Side cutters: Also known as diagonal pliers or wire cutters. These pliers are used for cutting wire and metal, rather than picking up metal.

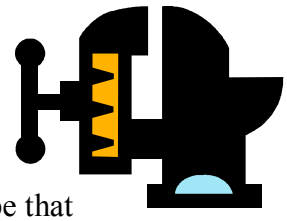
Flat-nose pliers: These pliers have smooth, flat, straight jaws that don't taper. They are ideal for bending and crimping wire and holding pieces of metal.



SUPPORT TOOLS

Reading Text, Document Use

Vise



A vise allows you to hold metal in place as you work, leaving both of your hands free.

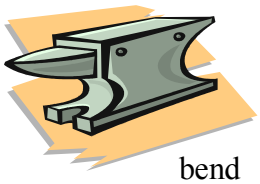
There are several types you could use in jewellery making including the type that you attach to the leg of the workbench and the kind that are mounted on the top of a workbench.

In jewellery making it is important to protect the metal with a soft wrap so the vise does not leave any marks on the metal, especially if your vise has a textured finish. You also want to make sure you don't damage the metal by over tightening the vise.

Tips for Using a Vise:

- Assess the work that needs to be done and select the correct vise for the job
- Protect the silver with a cloth
- Place the piece in the jaws of the vise
- Screw the jaws together
- Continue tightening until the metal is secure
    - Be careful not to over tighten the vise

Anvil and Bench Block



An anvil is a block of iron that jewellery makers use as a base when they are hammering either hot or cold metal. Anvils also have horns or points of metal that stick out from the ends. These horns can be used to round and bend metal.

A bench block, like an anvil, is a block of steel that provides an ideal surface for working metal. The bench block is a square, flat piece of steel. However, it won't have horns for rounding metal.

Bench Pin

Jewellery makers use bench pins to support metal while they are sawing, filing and cutting. In most cases it's a piece of wood that can be attached to a table. The V shape and the hole in the pin, creates room for you to move your tools around and reach the metal at difficult angles.

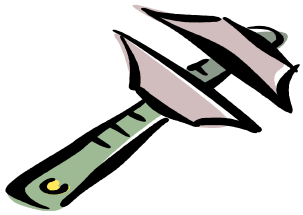
MEASURING TOOLS

Reading Text, Document Use

Calipers

Jewellery makers use steel calipers to measure the external diameter or thickness of metal. For example, if you want to measure the thickness of a piece of wire, you would use calipers.

There are many types of calipers, including ones that have digital screen displays.



Tips for Using Calipers:

- Place the two caliper arms on either side of the piece you are measuring
- Tighten the caliper
- Read the measurement on the caliper

Ruler

Rules are important in jewellery making. It is likely that you will need to measure sheets of metal and wire.

In most cases, you will be using a ruler that has both Imperial (inches) and SI (metric) measurements. Ideally you will want to be able to use both systems of measurement.

You will also want to make sure you use a metal ruler because you will be working around heat and flames.

Tape measures are also helpful.

MACHINES

Reading Text

Polishing Machine

Polishing machines come with several wheel attachments. The motor spins the wheel that holds the various polishing tools. You need to work carefully; the motor will spin the wheel 2,800-3,000 rpm's (rotations per minute). As the wheel spins you move your piece into the tool.

Rolling Mill

A rolling mill may not be a top priority piece of equipment for someone just starting out, but they are invaluable to an established jewellery maker. Rolling machines allow you to change the thickness of a sheet of metal so you can create the ideal size for each project.

Rolling mills have two adjustable rollers that press sheets of metal to reduce their thickness. You send a piece of metal through the rollers and it comes out the other side thinner.

Similar to the drawing wire, you need to reduce the thickness of the metal slowly until you have the size you want. It may also be necessary to anneal and pickle your metal after it has been rolled a few times.

Ultrasonic Cleaner

Ultrasonic cleaners are machines that use ultrasound and a cleaning solution to clean small items. It works well for cleaning anything with grooves and crevices.

To use an ultrasonic cleaner, you place a commercial cleaning solution in the holding tank. You then place your finished jewellery piece in the liquid. When the machine is turned on, a current creates ultrasonic waves in the liquid. These waves, along with the cleaner remove any dirt and contaminants from the jewellery. This process may only take two or three minutes.

ACTIVITIES

INTRODUCTION

Reading Text, Document Use, Oral Communication

Thinking Skills: Finding Information, Critical Thinking

The following section will provide you with step-by-step guidelines for building six pieces of jewellery: a ring, a chain, a bracelet, a broach, earrings and a pendant. Although you may not make all six of these pieces in this course you will have these notes for your future reference.

You may want to keep these notes open as you work so that you can quickly check your progress and identify your next steps. However, keep your notes away from flames and chemicals.

As you make your jewellery pieces you will be developing your technical skills. You will also continue to develop your Essential Skills. For example, the combination of the steps in each of these projects is a good example of the Essential Skill called Job Task Planning and Organizing.

If you have any questions, refer back in your Student Notes to find the answers or ask your instructor. Use the Table of Contents in your Student Notes to help you find information.

When completing the steps in this Activities section, follow all safety procedures outlined in your Student Notes and presented by your instructor. For example:

- Use caution when applying flux, pickle and Liver of Sulfur
- Handle torches with extreme caution and work closely with your instructor
- Stay alert when using saws and other tools
- Wear all safety gear
- Check that your work area is clean and tidy
- Remove any flammable materials
- Ensure your tools are ready and in good repair

RING

INTRODUCTION

Reading Text, Oral Communication

This first project details the steps for making a sterling silver ring.

As you create your ring you will learn basic jewellery making skills that will help you in all of your future projects. You will learn about: designing, cutting, forming, soldering, annealing, filing, sanding and polishing.

In addition to developing skills in ring making, this section will cover jewellery making tools, equipment and chemicals such as flux, Liver of Sulfur and pickle.

http://www.vdavidson.com/

Materials and Design:

The first step in any project is deciding on the materials and a design. For this project your ring will be made from sterling silver.

You will have the opportunity to create, pierce and cut out a pattern of your own design.

If you don't feel confident in your artistic abilities, there is no need to worry. You can still have success in designing your ring. The key is to keep your design simple. Also keep in mind your current jewellery making skills. You don't want to design something you will not be able create. When in doubt, ask your instructor for their assistance and opinions.

STEP ONE – RING SIZE

Document Use, Oral Communication, Numeracy

Thinking Skills: Decision Making

YOU WILL NEED:

- ✓ Dental floss/string
- ✓ Ring gauge
- ✓ Jeweller's saw and blades
- ✓ Bench pin
- ✓ Ring charts/Table of Ring Blank Lengths
- ✓ Tape measure/ruler
- ✓ Silver plates
- ✓ Pen

You will need two sterling silver plates, one piece will have a "plate thickness" of approximately 0.6 millimetre (0.024 inch) and the other will have a thickness of 0.8 millimetre (0.032 inch).

Sizing: (Option One):

- ☐ Decide which finger you want to wear the ring on
- ☐ Wrap a length of dental floss or string around your finger
- ☐ Mark the string/floss where it meets using a pen
    - o Work with a partner
- ☐ Remove the floss/string
- ☐ Measure the floss/string from the end to the pen mark using a ruler or tape measure
    - o Use millimetres
- ☐ Determine your ring size by finding the length on the ring chart

Sizing: (*Option Two*):

☐ Use a ring gauge to determine your ring size

Calculating Silver Length:

☐ Add together the thickness of the two metal plates you will be using

- In this case 0.6 mm + 0.8 mm = 1.4 millimetres (0.06 inch)
- Find your ring size "Table of Ring Blank Lengths"
- Find the thickness of the metal on the "Table of Ring Blank Lengths"
- Find the place where "your ring size" and "the thickness of the metal" intersect
  - The place where they intersect on the chart will give you the metal length you will need for your ring size
  - For example, if you have a ring size of 8 and a metal thickness of 1.4 millimetres you will need to cut your metal pieces so they are 60.9 millimetres long (2.5 inches)

Cutting the Silver:

☐ Cut the two pieces of sterling silver the length you have calculated

- Ask your instructor about width recommendations
- The thicker piece (0.8 millimetre) needs to be slightly longer and wider than the thinner (0.6 millimetre) piece
- Use a jewellers saw to make the cut and a bench pin for support

Note: Talk to your instructor before making any cuts.

STEP TWO - DESIGN AND TRANSFER THE PATTERN

Document Use, Oral Communication

YOU WILL NEED:

- ✓ Sketch paper
- ✓ Pencil
- ✓ Glue/rubber cement
- ✓ Scissors

Design

- ☐ Sketch some designs using a pencil and a piece of paper
  - o Keep your design simple
  - o Avoid designs that will have too much detail
- ☐ Select one of your designs
  - o Ask your instructor and the others in your class for their opinions
- ☐ Place the thinnest piece of silver onto a piece of paper and trace the outside edges
- ☐ Transfer your design inside this penciled border
  - o End your design before it reaches the top and the bottom edges
  - o Ensure that your design won't cut your piece of silver in two
- ☐ Cut out your paper design and glue it onto the thinnest silver plate
  - o Your paper should cover the entire surface of the plate

Example Ring Designs:

http://jewelry-patterns.com/leasysilverrings.html

STEP THREE - CUT OUT THE DESIGN

Reading Text, Document Use, Oral Communication

Thinking Skills: Decision Making

In this next step you will cut out the design. You will only be working with the thinner piece of silver with the glued pattern. Eventually the two pieces of silver will be stacked, with the thicker plate (0.8 millimetres) on the bottom and the thinner plate (0.6 millimetres) on the top.

YOU WILL NEED:

- ✓ Centre punch
- ✓ Ball peen hammer
- ✓ Drill
- ✓ Bench Pin
- ✓ Bench block/anvil
- ✓ Drill bits
- ✓ Jeweller's saw and blades
- ✓ Aluminum oxide sandpaper 320 grit
- ✓ Files
- ✓ Wood working surface

☐ Punch divots in your pattern, where you need to remove the silver

- o Use a centre punch and a hammer
- o Work on a steel bench block or anvil
- o Only work from one side of the silver; the side with the glued pattern

☐ Place the silver on a wood surface

☐ Choose a drill bit and insert it into the drill

- o The bit must be small enough to fit inside the pattern and the divot
- o If you are unsure, ask your instructor for assistance

☐ Drill a hole in your piece everywhere you have a divot

- o Make the hole large enough so that you can thread a blade from your jeweller's saw

☐ Cut out the pattern using a jeweller's saw

- Remove one end of the blade
- Thread the blade through the design, then reattach the blade to the saw frame
- Work in the "V" of your bench pin
- Saw around the design and remove the silver

Sand:

☐ Remove any remaining paper from your silver

☐ Peel off the glue

☐ File the edges

- Piercing will leave rough edges

☐ Sand the back of the piece (the flat surface)

- The back is the side that did not have the paper and glue
- This is the side that will be soldered onto the thicker piece of silver
- Use a wet/dry aluminum oxide sandpaper (320 grit)

☐ Clean the silver

☐ Sand the other piece of silver (the solid thicker piece)

- You only need to sand one side, the side that will be soldered

☐ Clean the silver

STEP FOUR - ANNEAL

Document Use, Numeracy

YOU WILL NEED:

- ✓ Soldering block
- ✓ Torch and striker
- ✓ Tweezers
- ✓ Timer
- ✓ Water container
- ✓ Flux solution and hot plate
- ✓ Crock-Pot
- ✓ Pickle solution
- ✓ Copper/brass tongs and a wire basket

Anneal the Top Piece:

- ☐ Lay the patterned piece of silver on a soldering block with the back facing up
  - o The back is the side that you sanded
- ☐ Light the torch with help from your instructor
  - o Use a striker not a match
- ☐ Heat the piece with the torch until it is a straw yellow colour
  - o Work carefully, you don't want to overheat the silver
  - o Keep the flame moving so the heat is not focused too long in one spot
- ☐ Pick up the entire piece and submerge it into a warm flux solution
  - o Use tweezers to pick up the silver
- ☐ Place the silver on the soldering block and heat again, until it is a dark red
  - o The silver will be the right temperature when the flux becomes shiny
  - o Dim the lights so that you can easily gauge the colour of the silver

- [ ] Remove the heat and wait a few seconds until the red colour is gone
- [ ] Quench in water quickly, using tongs
- [ ] Place the silver in the pickle solution
    - Use copper or brass tongs
- [ ] Set the timer for 5 minutes
- [ ] Remove the silver from the pickle using a wire basket or copper/brass tongs
- [ ] Rinse and dry the silver
- [ ] Place the piece of silver on a soldering block

Anneal the Bottom Piece:

- [ ] Repeat these steps with the solid piece of silver
    - This will be the bottom piece of your ring

STEP FIVE - SOLDER THE TWO PIECES TOGETHER

Document Use, Numeracy

Thinking Skills: Decision Making, Critical Thinking, Problem Solving

YOU WILL NEED:

- ✓ Soldering block
- ✓ Torch and striker
- ✓ Tweezers
- ✓ Medium silver solder pellets
- ✓ Timer
- ✓ Files
- ✓ Flux solution and hot plate
- ✓ Crock-Pot
- ✓ Pickle solution
- ✓ Water container
- ✓ Solder pick
- ✓ Sandpaper
- ✓ Copper/brass tongs and a wire basket

The soldering technique described in this step is called sweat soldering or overlay.

Preload Solder

- ☐ Place the patterned piece on the solder block with the back side facing up
- ☐ Light your torch
- ☐ Heat the piece until it is a straw yellow colour
- ☐ Place it in the warm flux to coat it
- ☐ Preload medium silver solder pellets on the back side of the pierced piece of silver
  - o Assess the area you need to cover and select pieces of solder that are the right size for the area
  - o Pick up the small solder pellets with tweezers
  - o Cover the piece with solder

- The amount of solder you will need depends on the size of the pellets however, 20 to 25 pellets is about average for a ring
- You want to use enough solder that the surface will be covered in an even layer when it's melted. If you use too much solder, the holes in your pattern will fill in and/or the solder will flood out the edges

- Use your solder pick to move the pieces around

Melt the Solder:

- ☐ Light your torch
- ☐ Heat the solder gently, on low heat
  - Allow the flux to evaporate
  - The solder will start to melt about the same time the flux becomes shiny
  - Work carefully so that the pellets don't move
- ☐ Turn the torch up to a medium or aggressive high heat
  - Keep the torch moving
  - Use your solder pick to keep solder in the right place
- ☐ Continue until the solder melts
  - Pellets will slump and then pool
- ☐ Leave your piece to air cool
- ☐ Place the piece into the pickle
- ☐ Set the timer for 5 minutes
- ☐ Remove the piece from the pickle using tongs or wire basket

- ☐ Wet sand the soldered area
  - o Take off the top of the solder
  - o Work carefully so you don't remove all of the solder
- ☐ Rinse your piece well after sanding

Attach the Two Silver Pieces:

- ☐ Heat one of your two silver pieces to a straw yellow colour
- ☐ Dunk the piece in flux
  - o Leave the piece in the flux until it stops making a sizzling noise
- ☐ Repeat with the other piece of silver
- ☐ Place the solid piece of silver on the soldering block, sanded side up
- ☐ Place the top piece (the patterned piece) onto the bottom piece, solder side down
  - o The solder will be sandwiched between the two pieces

Solder:

- ☐ Gently heat the silver until the flux evaporates
  - o You will be heating both pieces evenly but focus on the base piece
  - o Remember solder will flow to the hottest spot
- ☐ Increase the heat until the solder melts and joins the two pieces
  - o Work carefully so that the silver does not overheat
  - o You won't be able to see the solder so it is important to watch the flux
    - ▪ The flux will be shiny when the solder melts and starts to flow
  - o Watch for a silver line to appear along the edges where the two pieces meet

- ☐ Air cool
- ☐ Place your piece into the pickle using copper/brass tongs
- ☐ Set the timer for 5 minutes
- ☐ Remove the ring from the pickle using a wire basket or copper/brass tongs
- ☐ Wash and dry the ring

Problem Solve:

- ☐ Assess the ring for possible problems
- ☐ If the pieces are not joined solidly or there is a gap:
  - Repeat the soldering steps
    - Clean the metal, dip the piece in the flux, then add solder if necessary
    - Heat the piece as before, until the solder flows
- ☐ If the solder has filled the holes in your pattern:
  - You can try sanding away the excess solder
  - Reflux and heat the piece again from the bottom to redistribute the solder
- ☐ If the solder has flooded out the sides
  - File or sand away the extra solder
- ☐ If you have fire scale on your silver
  - Return the piece to the pickle
  - Sand the metal

If there are no problems, or you have fixed the problems, you will be ready to move on to the next stage.

STEP SIX - FORM THE RING

Document Use, Numeracy

Thinking Skills: Critical Thinking, Problem Solving

YOU WILL NEED:

- ✓ Ring gauge/charts
- ✓ Sandpaper
- ✓ Rawhide hammer
- ✓ Ruler or measuring tape
- ✓ Jeweller's saw and blades
- ✓ Files
- ✓ Vise
- ✓ Ring Mandrel

Prepare the Silver

- ☐ Measure the length of the piece
- ☐ Compare the length to your original ring size measurements
  - o Use your ring gauge and/or ring charts
  - o If it's too long, use your jeweller's saw to trim it
- ☐ Assess the silver piece
  - o Check that the top and bottom pieces are evenly aligned
  - o If necessary, use your jeweller's saw to cut off any overhanging piece
- ☐ File the edges of the piece until they are even and smooth
- ☐ Wet sand the edges and the back of the ring
  - o The back will be the part of the ring that will be against your finger

Form the Ring

- ☐ Secure the ring mandrel in a vise
  - The mandrel can stick straight up or out to the side
- ☐ Place the silver piece against the mandrel
  - The inside of the ring will rest on the mandrel (pattern facing up)
- ☐ Bend the silver around the mandrel using a rawhide hammer
  - Begin by hammering one end
    - Don't start in the middle of the silver
  - Work back and forth from one end to the other
- ☐ Continue until the two ends line up
  - You will have a circle of silver
- ☐ Remove the ring
- ☐ Run a jeweller's saw between the two ends to create a parallel line where they meet
- ☐ Position the ring on a wooden surface with the gap at the top
- ☐ Hammer the ring gently with a rawhide mallet near the joint
  - This forces the two edges together at the tip
  - If they don't line up, continue tapping them until they do
  - You can also run a jeweller's saw through the joint again to keep the ends parallel

STEP SEVEN - FINISH SOLDER

Document Use

Thinking Skills: Critical Thinking

YOU WILL NEED:

- ✓ Soldering block
- ✓ Torch and striker
- ✓ Tweezers
- ✓ Easy silver solder pellets
- ✓ Timer
- ✓ Water container
- ✓ Flux solution and hot plate
- ✓ Crock-pot
- ✓ Pickle solution
- ✓ Solder pick
- ✓ Cross lock tweezers
- ✓ Copper/brass tongs and a wire basket

Load Solder:

- ☐ Return the ring to the soldering block
- ☐ Light the torch
- ☐ Heat the ring to a straw yellow colour
- ☐ Pick up the piece using tweezers and dip it into the flux solution
- ☐ Pick up the ring at the bottom using cross lock tweezers
- ☐ Sit the ring on the solder block with the joint facing up
  - o The cross lock tweezers will provide support for the ring
- ☐ Place two or three easy silver solder pellets where the two ends meet

Solder:

- ☐ Light the torch
- ☐ Heat the ring with a gentle heat until the flux evaporates
- ☐ Increase the heat
  - Heat the ring evenly watching for the flux to become shiny
  - Direct the heat toward the joint heating both ends evenly until the solder flows
- ☐ Hold the solder pick in one hand and torch in other
- ☐ Direct the solder with the pick as it melts and flows into the joint
- ☐ Air cool the ring
- ☐ Pick up the ring with copper/brass tongs and place it in the pickle
- ☐ Set the timer for 5 minutes
- ☐ Remove the ring from the pickle using a wire basket or copper/brass tongs
- ☐ Wash and dry the ring
- ☐ Assess the joint
  - Are the two ends joined? Are there any gaps in the solder?
- ☐ Repeat these steps if you need to fix the joint

STEP EIGHT - SIZE THE RING

Document Use, Numeracy, Oral Communication

Thinking Skills: Problem Solving

YOU WILL NEED:

- ✓ Rawhide hammer
- ✓ Vise
- ✓ Ring Mandrel
- ✓ Jeweller's saw and blades
- ✓ Files
- ✓ Planishing Hammer

Round the Ring:

- ☐ Dry the ring
  - o You may notice that the ring is more oval than round
- ☐ File off any exposed solder
  - o Ask your instructor for help selecting the right file size
- ☐ Slide the ring onto the mandrel
  - o You may want to place the mandrel in the vise
- ☐ Hammer the ring on the mandrel until it rounds
  - o Use a rawhide hammer
  - o Work carefully so you don't mark the silver
- ☐ Check the size of the ring on the mandrel
  - o This will give you the inside diameter of the ring

Adjust the Size:

- ☐ Try on the ring

If the ring is too big:

- ☐ Cut the ring with a jeweller's saw at the solder joint
  - If you decrease the ring size by 2.5 mm (0.09 inch) you will decrease it by one size
- ☐ Re-solder the ring

If the ring is too small:

- ☐ Place the ring on a mandrel
- ☐ Hammer gently, tapping all around the ring until it moves down the mandrel
  - Use a planishing hammer
  - You will only be able to increase the ring by half a size

When the ring is the right size you can move on to the next stage.

STEP NINE - FILE/SAND/POLISH/COLOUR/CLEAN

Document Use

Thinking Skills: Critical Thinking

YOU WILL NEED:

- ✓ Liver of Sulfur
- ✓ Ultrasonic cleaner and solution
- ✓ Sandpaper
- ✓ Polishing compound (abrasive and fine)
- ✓ Timer
- ✓ Suede
- ✓ Files
- ✓ Paint stick
- ✓ Glue

File and Sand:

☐ File the ring to remove any excess solder or rough edges

- o For a smoother ring, bevel/angle the inside edges of the ring

☐ Sand the ring inside and out

- o Start with heavier grit if you have scratches to remove
- o Finish with a finer grit
- o You can glue sandpaper to a paint stick to make a sanding stick
- o Wash the ring between grit changes
- o Work carefully so you don't remove any of the pattern

☐ Wash the ring when you have finished sanding

Note: Sanding could take up to an hour.

Polish

- ☐ Rub an abrasive polishing compound onto a piece of suede
  - You can hold the suede or glue it onto a paint stick to make a polishing stick
- ☐ Polish the ring
- ☐ Wash the ring
- ☐ Use a less abrasive compound and another piece of suede
- ☐ Polish the ring
- ☐ Wash the ring
- ☐ Assess the ring
  - Continue polishing until you have the look you want

Optional:

Add Colour:

- ☐ Dissolve a piece of Liver of Sulfur in warm water
  - Do not work near the pickle solution
  - Use a piece of Liver of Sulfur about the size of a pea
- ☐ Place the ring in this warm solution until it is the colour you want
  - The ring will turn black
- ☐ Rinse and dry the ring
- ☐ Polish the ring to remove the black
  - The black colour will stay in the recesses of your design making the pattern stand out

Final Cleaning

- ☐ Place the ring in the ultrasonic cleaner
  - Use a commercial cleaning solution and water
- ☐ Set a timer for 2 or 3 minutes
- ☐ Remove, wash and dry

Congratulations you have finished your ring!

CHAIN NECKLACE

INTRODUCTION

Reading Text

The second project in this Activities section is a chain necklace.

As you build your chain you will have a chance to develop many of the skills you learned making your ring. For example, you will be using a jeweller's saw, torch and solder. You will also complete some of the same finishing steps. You will also learn new skills such as drawing wire and making jump rings.

Materials and Design

As mentioned, the first step in any project is deciding on materials and a design. For your necklace, you will start with round sterling silver wire that will be about 2.5 millimetres (0.09 inch) in diameter (10 gauge).

You will also have the option of deciding on the type of chain you will create and the type of beads or found items you will use.

Note: The wire you will be using will not need to be annealed before you begin.

STEP ONE - DECISIONS

Document Use, Oral Communication

Thinking Skills: Decision Making

YOU WILL NEED:

- ✓ Silver wire
- ✓ Side cutters

Decisions:

- ☐ Who are you making the chain for?
- ☐ Do you want a long or short chain?
- ☐ Will you make a plain chain or a chain with beads and/or found items
  - o Discuss your design ideas with your instructor
- ☐ What colours will you use?

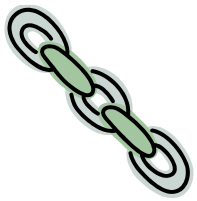
Design Options:

- ☐ Chain size
  - o Thicker chains use more metal which makes them stronger but heavier
  - o Thinner chains use less metal which makes them dainty and lighter

Found items are things you decide to use in your jewellery that are not designed specifically for jewellery making. For example, you may decide to use a sea shell you found at a yard sale or a guitar pick you used when you were learning to play.

☐ When deciding on chain style options you can select:

- Length
- Size and shape
- Texturing
- Patterns



For Example:

You may decide to have three small rings, followed by two big rings, then three small rings and two big, and so on.

☐ Select and cut a length of wire, using side cutters

- At first, selecting the right length of wire for the length of chain you want will be trial and error
- Ask your instructor for assistance

STEP TWO - DRAW WIRE

Reading Text, Document Use, Numeracy

Thinking Skills: Decision Making

As mentioned, the wire you will start with will be 2.5 millimetres in diameter. If you decide to use a thinner wire for your necklace you can use a draw plate to decrease the wire dimensions.

YOU WILL NEED:

- ✓ Silver wire
- ✓ Files
- ✓ Draw tongs
- ✓ Bench Pin
- ✓ Draw plate and padding
- ✓ Vise
- ✓ Calipers

<u>Lengthen Wire/Decrease Diameter:</u>

☐ Straighten your wire if it has been coiled

- Place one end of the wire in a vise, grab the other end with draw tongs and pull the wire straight

☐ File one end of the wire so it's tapered

- Use a bench pin as a work base
- Tapering the end will allow you to fit the wire through a draw plate hole that is smaller in diameter than the wire

☐ Select a draw plate

- You will need a draw plate with a hole slightly smaller than the dimension of your original wire (0.1 millimetre smaller). For example, if your wire has a diameter of 2.5 millimetres use a hole that measures 2.4 millimetres
- Determine whether the draw plate measurements are Imperial or SI (Metric)

- ☐ Put the draw plate in a vise horizontally, with the numbers facing you
  - Protect it from scratches with some type of padding
- ☐ Thread the wire through the hole you have selected
  - Work from the back of the draw plate
- ☐ Grab the wire at the front of the draw plate with draw tongs
- ☐ Pull the wire through the hole
  - The wire will get longer and thinner
- ☐ Continue drawing the wire, using smaller and smaller holes until it's the size you need
  - Decrease the wire size slowly
- ☐ Use calipers to measure the wire to make sure you have reached the size you need

Note: You will need to anneal your wire when it has reached the right size. Also, if you draw the wire more than three times, you will need to anneal it before you continue; otherwise the wire will become brittle and break.

Caution: The wire will be hot right after it is drawn through the plate. It is also important to watch closely as the end of your wire is about to clear the hole.

STEP THREE - ANNEAL

Document Use, Numeracy

YOU WILL NEED:

- ✓ Torch and striker
- ✓ Soldering block
- ✓ Tweezers
- ✓ Water container
- ✓ Timer
- ✓ Crock-pot
- ✓ Flux solution and hot plate
- ✓ Vise
- ✓ Draw Tongs
- ✓ Pickle solution
- ✓ Copper/brass tongs and a wire basket

Anneal the Wire:

- ☐ Wind the wire into a coil around one of your fingers
- ☐ Slide the wire off your finger and lay it on a soldering block
- ☐ Heat the wire until it reaches the straw yellow colour
  - o Work carefully so you don't overheat the silver
  - o Keep the flame moving so the heat is not concentrated in one spot for too long – this is critical when you are working with wire
- ☐ Pick up the wire with tweezers and submerge it in a warm flux solution
- ☐ Place the wire on the soldering block and heat it to a dark red
  - o Watch the flux, the silver will be the right temperature when the flux is shiny
  - o You may want to dim the lights so that it is easier to gauge the colour of the silver
- ☐ Remove the heat and wait a few seconds until the red colour is gone

- ☐ Quench in water quickly
- ☐ Place in the warm pickle solution
  - Use copper or brass tongs
- ☐ Set your timer for 5 minutes
- ☐ Remove from pickle using a wire basket or your copper/brass tongs
- ☐ Rinse the wire in water and dry it
- ☐ Uncoil the wire by hand
- ☐ Grab one end of the wire with draw tongs and pull until the wire is straight

STEP FOUR - JUMP RINGS

Reading Text, Document Use

Thinking Skills: Decision Making

In this next step you will use the wire to make jump rings. Jump rings are individual circular wire loops or rings that are open on one side. You connect the jump rings together to create a chain.

Jump Rings http://www.ndesignsmetal.com/?p=662

YOU WILL NEED:

- ✓ Bench pin
- ✓ Pliers including two pair of flat nose pliers
- ✓ Jeweller's saw and blades
- ✓ Mandrels (various sizes)
- ✓ Hand drill
- ✓ Silver wire
- ✓ Vise

Make Jump Rings:

- ☐ Select a mandrel, based on the size of jump rings you want
  - o You can use knitting needles as mandrels
- ☐ Put the mandrel in a hand drill
- ☐ Put the handle of the drill into the vise
- ☐ Bend the wire, making an "L" shape at one end, using pliers
- ☐ Slide the "L" part of the wire into an open section of the drill (the chuck)
- ☐ Slowly wind the hand drill

☐ Guide the wire with your thumb on top of the wire

- You want the wire to wrap side-by-side down the mandrel
- Work carefully, the end of the wire will be sharp

Cut Jump Rings:

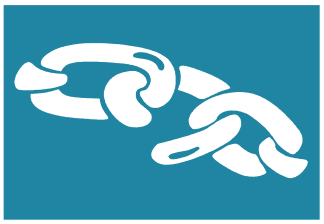
☐ Slide the coil of wire off the mandrel

☐ Support the coil on a flat surface or use the edge of your bench pin

☐ Cut the coil of wire along one edge, using a jeweller's saw

☐ Separate rings

Assemble Your Chain:



☐ Grasp one jump ring on both sides of the opening, using two pairs of flat nose pliers

☐ Twist the ring in opposite directions to widen the opening

- You will repeat this process for each jump ring

☐ Loop the individual jump rings together

- The chain pattern will depend on your design
- Twist the rings closed using the pliers
- Line up the two ends of each jump ring

☐ Continue until you have a chain of jump rings the right length and pattern for your project

☐ Assess the chain

- Is it long enough?
- Is it the design you wanted?

Note: Repeat these steps if you need to make more jump rings to lengthen the chain.

STEP FIVE - SOLDER

Document Use, Numeracy, Oral Communication

Thinking Skills: Problem Solving

Note: If you want to add stones, beads or found items, you will need to add them when you have finished soldering so they don't come in contact with the heat.

YOU WILL NEED:

- ✓ Soldering block
- ✓ Charcoal block
- ✓ Torch and striker
- ✓ Cross lock tweezers
- ✓ Timer
- ✓ Self pickling flux
- ✓ Solder pick
- ✓ Paint brush
- ✓ Silver solder pellets
- ✓ Crock-pot
- ✓ Pickle solution
- ✓ Copper/brass tongs and a wire basket

Solder the Jump Rings:

- ☐ Pick up one jump ring at the bottom (opposite the opening) using cross lock tweezers
- ☐ Sit the jump ring on the solder block with the joint facing up
  - o Use the tweezers to balance the jump ring
- ☐ Light the torch
- ☐ Heat the first jump ring to a straw yellow using a very small flame
  - o The rings are small so they will heat quickly
- ☐ Apply self pickling flux to the ring using a small paint brush
  - o Pour a small amount of flux into the lid rather then using a large container

- [ ] Pick up a small silver solder pellet and dip it in the self pickling flux, using tweezers
  - Choose hard, medium or easy solder depending on the number of solder joints you have close together
  - Ask your instructor for assistance
- [ ] Place the solder pellet on the charcoal block
- [ ] Apply heat to the solder until it forms a ball on the charcoal
  - Use a small flame for low heat
- [ ] Pick up the melted solder with a soldering pick
- [ ] Heat the prepared jump ring (the one you dipped in the flux) until it's shiny
  - Focus the heat on the joint
- [ ] Place the solder pellet across the top of the joint where the two ends meet
  - The solder will melt into the joint
- [ ] Repeat these steps for each jump ring, until you have a solid chain
- [ ] Air cool the chain
- [ ] Pick up the chain with copper or brass tongs and place it in the pickle
- [ ] Set the timer for 5 minutes
- [ ] Remove the chain from pickle using a wire basket or copper/brass tongs
- [ ] Rinse and dry the chain

Problem Solve:

- ☐ Assess the chain for possible problems
- ☐ If the pieces are not joined solidly or you find gaps in the solder:
  - Repeat the soldering steps
- ☐ If you have soldered two jump rings together or you have melted a jump ring
  - Remove the jump ring and replace it with a new one
- ☐ If you have fire scale on your silver
  - Return the piece to the pickle
  - Move to the sanding and polishing stage

If there are no problems, or you have fixed the problems, you will be ready to move on to the next stage.

STEP SIX - FILE/SAND/POLISH

Document Use, Numeracy

Thinking Skills: Decision Making

YOU WILL NEED:

- ✓ Files
- ✓ Polish compound (abrasive and fine)
- ✓ Suede
- ✓ Timer
- ✓ Sandpaper
- ✓ Paint stick
- ✓ Glue
- ✓ Tumbler
- ✓ Ultrasonic cleaner and solution

File and Sand:

- ☐ File off any excess solder or rough edges from each of the jump rings
- ☐ Sand the chain, washing between grit changes and after the final sanding

Polish

- ☐ Polish the chain using an abrasive polishing compound on a piece of suede
- ☐ Wash the chain
- ☐ Use a fine compound on a new piece of suede and polishing again
- ☐ Wash the chain
- ☐ Assess the chain
    - o Continue polishing until you have the look you want

Optional:

If you have access to a tumbler you can move directly from the filing and sanding stage to the tumbler, skipping the polishing stage.

- ☐ Place the chain in the tumbler
  - This must be done before beads or found items are added
- ☐ Rinse well and dry

Final Cleaning

- ☐ Place the chain in ultra sonic cleaner
  - Use a commercial cleaning solution and water
- ☐ Set a timer for 2 or 3 minutes
- ☐ Remove, wash and dry

STEP SEVEN – ADD BEADS

Document Use

Thinking Skills: Decision Making

YOU WILL NEED:

- ✓ Beads and or found items
- ✓ Needle nose pliers
- ✓ Flat nose pliers
- ✓ Bench pin
- ✓ Drill
- ✓ Drill bits
- ✓ Files

Add Beads:

☐ Decide which beads or found items you want to add

- o If you are using found items you will need to drill a hole for the wire
- o You can also wrap items with wire

☐ Cut a piece of silver wire long enough to thread beads or found items

- o The wire must be long enough that it can be looped at each end
- o You may choose to use one or more beads or found items

☐ File the ends of the wire flat, working on your bench pin

☐ Thread the wire through the beads (or bead) and found item(s)

☐ Bend the wire at both ends to create a loop

- o Use needle nose pliers
- o Leave an opening so the loop can be connected to the chain

☐ Attach the beads to your chain by looping the wire through a jump ring

☐ Close the loops using flat nose pliers

☐ Continue until you have attached all the beads you want on your chain

Congratulations you have finished your chain necklace!

BRACELET

INTRODUCTION

Reading Text

The following activity outlines the steps for your third project, a copper cuff bracelet.

You will use a copper plate about 8 centimetres (3 inches) wide by 30 centimetres (12 inches) long. This should be more than enough metal for your bracelet.

You will be able to select from a number of different techniques for creating designs and patterns in the metal.

STEP ONE – DECISIONS AND SIZING

Document Use, Oral Communication, Numeracy

Thinking Skills: Decision Making

YOU WILL NEED:

- ✓ Copper plate
- ✓ Ruler or tape measure
- ✓ Jeweller's saw
- ✓ Paper

Decisions:

- ☐ Who are you making the bracelet for?
- ☐ Do you want to pierce a design?
- ☐ Do you want to create a textured pattern/design using a planishing hammer?
- ☐ Do you want to create a design using stamps/punches?
  - o Talk to your instructor about the selection of stamps available
- ☐ Do you want a bracelet with flat, straight edges or one with curved or zigzag edges?

Sizing:

- ☐ Cut out a piece of paper, to match the size you will need for your bracelet
- ☐ "Try it on" your wrist and continue to cut to make adjustments
  - o This will help you determine the length of copper you will need
- ☐ Measure the piece of paper
- ☐ Cut out a piece of copper the same size
  - o Talk with your instructor before making any cuts

STEP TWO - DESIGN THE BRACELET

Document Use, Oral Communication

Thinking Skills: Decision Making

YOU WILL NEED:

- ✓ Sketch paper
- ✓ Pencil
- ✓ Glue/rubber cement
- ✓ Scissors

Design

- ☐ Sketch some designs using a pencil and a piece of paper
  - o Keep your design simple
  - o Discuss patterns, techniques and edge options with your instructor
- ☐ Select one of your designs
  - o Ask your instructor and the others in your class for their opinions
- ☐ Place your copper on a piece of paper and trace the outside edges
- ☐ Sketch your design within this penciled border
  - o End your design before it reaches the top and bottom edges
- ☐ Cut out your design and glue it onto the copper plate
  - o Your paper should cover the entire surface

STEP THREE – CUT OUT YOUR BRACELET AND PATTERN

Document Use, Numeracy

YOU WILL NEED:

- ✓ Centre punch
- ✓ Ball peen hammer
- ✓ Drill
- ✓ Bench pin
- ✓ Steel bench block/anvil
- ✓ Drill bits
- ✓ Jeweller's saw and blades
- ✓ Aluminum oxide sandpaper
- ✓ Files
- ✓ Wood working surface

Shaping your bracelet:

☐ Using a jeweller's saw, cut out the shape for your bracelet – the outside edges

Optional: (Only use these next steps if you are piercing a pattern.)

☐ Punch divots in your pattern, where you need to remove the copper

- o Use a centre punch and a hammer
- o Work on a steel bench block or anvil
- o Only work from one side of the copper; the side with the glued pattern

☐ Transfer your copper to a wood surface

☐ Choose a drill bit and insert it into the drill

- o The bit must be small enough to fit inside the pattern and the divot

☐ Drill a hole in your piece everywhere you have a divot

- o Make the hole large enough for the blade from your jeweller's saw

- [ ] Cut out the pattern using a jeweller's saw
    - Remove one end of the blade
    - Thread the blade through the design, then reattach the blade to the saw frame
    - Work in the "V" of your bench pin
    - Saw around the design and remove the copper

Sand:

- [ ] Remove any remaining paper from your copper
- [ ] Peel off the glue
- [ ] File the edges
- [ ] Sand the edges of your piece
- [ ] Clean the copper

STEP FOUR - ANNEAL

Document Use, Numeracy

YOU WILL NEED:

- ✓ Torch and striker
- ✓ Crock-pot
- ✓ Timer
- ✓ Water container
- ✓ Pickle solution
- ✓ Timer
- ✓ Solder block
- ✓ Copper/brass tongs and a wire basket

Anneal your Bracelet:

- ☐ Light the torch
- ☐ Heat the copper on a solder block until it reaches a dark red colour
- ☐ Remove heat and wait a few seconds until the red colour is gone
- ☐ Quench in water quickly, using tongs
- ☐ Place in the pickle solution
  - o Use copper or brass tongs
- ☐ Set your timer for 5 minutes
- ☐ Remove the copper from pickle using a wire basket or copper/brass tongs
- ☐ Rinse the bracelet in water and dry it

STEP FIVE – TEXTURING/STAMPING

Document Use

YOU WILL NEED:

- ✓ Hammers
- ✓ Bench block or anvil
- ✓ Various stamps/punches

Optional: (Only use these next steps if you are adding a texture.)

- ☐ Use a high polish hammer with a rounded end, like a planishing or ball peen hammer
- ☐ Place the copper on a bench block/anvil
- ☐ Strike the copper with your hammer, creating marks in the metal
  - o If possible, practice on a scrap piece of copper first

Optional: (Only use these next steps if you are using a stamp/punch.)

- ☐ Select the stamp/punch you want to use
  - o If possible, practice on a scrap piece of copper first
- ☐ Place your copper bracelet on a steel surface or a flat wood surface
- ☐ Place the design end of the punch on your bracelet
- ☐ Hammer the flat end of the punch just enough to transfer the mark into the copper

STEP SIX - FORM THE BRACELET

Document Use

Thinking Skills: Problem Solving

YOU WILL NEED:

- ✓ Rawhide hammer
- ✓ Bracelet Mandrel
- ✓ Vise

Form the Bracelet

- ☐ Secure a bracelet mandrel in a vise, facing straight up
- ☐ Place the copper piece against the mandrel
  - The inside of the bracelet will rest on the mandrel (pattern facing out)
- ☐ Bend the copper around the mandrel using a rawhide hammer
  - Begin by hammering one end
    - Don't start in the middle of the copper
  - Work back and forth from one end to the other
- ☐ Continue until the two ends line up as desired
  - You will have a circle of copper
- ☐ Remove the bracelet

Adjust the Size:

- ☐ Try on the bracelet

If it's too small:

- ☐ Place the bracelet on the bracelet mandrel
- ☐ Hammer gently with a rawhide mallet
  - The bracelet will move down the mandrel
  - Keep checking the size

If it's too big:

- ☐ Place the bracelet on the bracelet mandrel
- ☐ Hammer the copper gently with a rawhide mallet to make more of a curve in the bracelet
  - This will make it smaller

Problem Solve:

- ☐ Assess the bracelet for possible problems
- ☐ If the two ends are not lined up
  - Hammer on the mandrel to adjust
- ☐ If you are not happy with the texture or design:
  - Place the bracelet on the bracelet mandrel
  - Add more textures or patterns to your bracelet

If there are no problems or you have fixed the problems, you will be ready to move on to the next stage.

STEP SEVEN – FILE/SAND/POLISH/CLEAN

Document Use, Numeracy

Thinking Skills: Critical Thinking

YOU WILL NEED:

- ✓ Ultrasonic cleaner and solution
- ✓ Sandpaper
- ✓ Polishing compound (abrasive and fine)
- ✓ Timer
- ✓ Suede
- ✓ Files
- ✓ Paint stick
- ✓ Glue

File and Sand:

- ☐ File the bracelet to remove rough edges
  - o For a smoother bracelet, bevel/angle the inside edges as you are filing and sanding
- ☐ Sand the bracelet
  - o Start with heavier grit if you have scratches to remove
  - o Finish with a finer grit
    - ▪ You can glue sandpaper to a paint stick to make a sanding stick
  - o Wash the bracelet between grit changes
  - o Work carefully so you do not remove any of the pattern
- ☐ Wash the bracelet when you have finished sanding

Note: Sanding could take up to an hour.

Polish

- ☐ Rub an abrasive polishing compound onto a piece of suede
  - You can hold the suede or glue it onto a paint stick to make a polishing stick
- ☐ Polish the bracelet
- ☐ Wash the bracelet
- ☐ Use a less abrasive compound and another piece of suede for the next stage
- ☐ Polish the bracelet
- ☐ Wash the bracelet
- ☐ Assess the bracelet
  - Continue polishing until you have the look you want

Final Cleaning

- ☐ Place the bracelet in ultra sonic cleaner
  - Use a commercial cleaning solution and water
- ☐ Set a timer for 2 or 3 minutes
- ☐ Remove, wash and dry

Congratulations you have finished your bracelet!

BROACH, PENDANT AND EARRINGS

INTRODUCTION

Reading Text, Oral Communication

Thinking Skills: Finding Information, Decision Making

The following section combines directions for making a broach, a pendant and earrings.

These three pieces will use the skills you have developed in your first three projects, the ring, chain and bracelet.

For these final projects, you can create your own design. For example, you may decide to sweat solder items onto your broach or pendant using the same soldering technique you used to join the two ring pieces. You may decide to pierce out a design using the techniques you used with your ring. As you know there are also a variety of chain options to choose from if you decide to make a pendant. You may want to use found items for the earnings, or you may decide to use beads.

Use the Table of Contents at the front of these Student Notes to help you find the steps from past projects. For example, if you are making a chain for your pendant, find the chain section and follow the steps. If you are piercing out your design, find the steps outlined in the ring section. If you want to use a stamp, find the steps outlined in the bracelet section.

These sections will also help you identify what you will need for the projects in the "You Will Need" area.

New Steps:

Although you will be using the techniques you have already developed in the first three projects there will be new steps to learn, specific to these three new projects. These new steps are outlined in the following section.

Please check with your instructor to confirm the specific steps you will need to follow for your piece.

You may complete one, two or three of these projects; but decide on one to start with.

STEP ONE – SELECT A PROJECT (BROACH, PENDANT OR EARRINGS)

Reading Text, Document Use

Thinking Skills: Decision Making

A broach, also written brooch, is a two dimensional soldered piece of jewellery that has a hinged pin on the back so it can be fastened to clothing.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A pendant is something that hangs on a chain, such as a gemstone.


http://www.vdavidson.com

You can decide to make either stud or hanging earrings.


http://www.vdavidson.com

STEP TWO - DESIGN (BROACH, PENDANT OR EARRINGS)

Document Use, Oral Communication

Thinking Skills: Decision Making

Design Decisions

- ☐ Sketch some designs
- ☐ Design considerations:
  - Who is this piece for?
  - How many pieces will you need to solder?
  - What materials will you use e.g. sterling silver or copper?
  - What other materials will you use e.g. beads and found items?
  - What colours will you use?
  - What theme and style do you want to create?
  - How big will the piece be?
  - How much will the piece weigh?
  - What techniques do you want to use?
    - Think about the techniques you have used in your other projects
- ☐ Keep your design simple
  - Avoid designs that will have too much detail
  - Consider the time you have to complete the project
- ☐ Select one of your designs
  - Talk to your instructor and the others in your class for their opinions

BROACH - FINDINGS

Reading Text, Document Use

As mentioned, if you are making a broach you will be using the techniques you have developed in your other projects. For example, you will need to follow the steps for soldering and using pickle, flux and polish.

Additional Steps for Making a Broach:

If you decide to make a broach you will need to learn some new steps. You will be required to solder a joint and catch to the back of your broach so it can be attached to a piece of clothing. This is called a pin back. It consists of three parts, a joint, catch and pin stem.

This is a challenging step:

- You will be working with very small pieces
- You will be soldering small pieces
    - If the solder flows into the catch (the opening/closing) it won't work

This step must be done when the broach is finished but not yet sanded or polished.

Findings: small ready made parts used in jewellery making.

These standardized parts are used so often it doesn't make sense for a jewellery maker to make them.

BROACH – ATTACH FINDINGS

Document Use, Numeracy, Oral Communication

Thinking Skills: Critical Thinking, Problem Solving, Decision Making

YOU WILL NEED:

- ✓ Soldering block
- ✓ Charcoal block
- ✓ Torch and striker
- ✓ Tweezers
- ✓ Silver solder pellets
- ✓ Timer
- ✓ Steel ruler or tape measure
- ✓ Flux and a hot plate
- ✓ Self-pickling flux
- ✓ Crock-Pot
- ✓ Pickle solution
- ✓ Sandpaper
- ✓ Brass/copper tongs and a wire basket

Prepare the Broach:

☐ Select the findings

- Ask your instructor for help selecting the right size findings for your broach
- This will include a joint, catch and pin stem

☐ Clean the back of the broach and sand it lightly

☐ Place the broach on the solder block with the back facing up

☐ Decide where you want to attach the findings

- Ideally you want the joint on the left and the catch on the right, with the closure facing down so that if it opens accidentally the broach will not fall off
- You want the weight of the broach to hold the catch closed

☐ Light the torch

☐ Heat the broach to a straw yellow

- [ ] Dip in warm flux
- [ ] Place the broach back on the soldering block, with the back facing up

Prepare the Findings:

- [ ] Measure the pin with a steel ruler or tape measure
- [ ] Measure the same distance from the joint to clasp
- [ ] Determine where on the broach they should be soldered
    - Alternatively, you can cut the pin to fit later or have the pin beside you as you solder the clasp onto the broach

Solder the Joint:

- [ ] Pick up the joint of your pin back with tweezers
- [ ] Heat the joint gently
    - It will heat fast because of its size
- [ ] Dip the joint in self pickling flux and set aside
    - Pour a small amount of self pickling flux into the lid
    - Only dip the bottom of the joint in the flux; this will keep the solder from flowing onto the entire joint
- [ ] Repeat with the catch (heat, dip it in self pickling flux, and set it aside)
- [ ] Pick up a piece of solder with tweezers
- [ ] Dip it into the self pickling flux

- ☐ Put the solder on a charcoal block
- ☐ Pick up the joint again with the tweezers and hold it with one hand
- ☐ Heat solder pellet until it balls up
- ☐ Touch the bottom of the joint to the solder ball
  - o Work quickly to transfer the solder to the joint
- ☐ Heat the broach while holding the joint with tweezers
- ☐ Watch for the flux to go shiny
- ☐ Set the joint onto the broach and watch for the solder to melt

Note: Soldering the joint and the catch should be done in the same soldering step, otherwise the broach will cool.

Solder the Clasp:

- ☐ Check the angle of the findings, to ensure that they run straight
- ☐ Make sure the opening is at the bottom
- ☐ Solder the catch onto the broach by repeating the steps listed above
- ☐ Air cool
- ☐ Place in pickle with copper/brass tongs
- ☐ Set the timer for 5 minutes
- ☐ Remove from the pickle using a wire basket or copper/brass tongs
- ☐ Wash and dry the broach

Assess:

- ☐ Check the solder joints
- ☐ Re-solder if there is a gap in the solder joint

Riveting the Pin Stem:

- ☐ Pickle, rinse and dry the broach
- ☐ Set the pin stem into the joint (the end of the pin with the hole)
- ☐ Cut the pin stem if it is too long, then file and sand the pin to a point (the end without the hole)
- ☐ Insert a piece of sterling silver round wire, through the joint and pin stem
  - Use wire with the right dimensions so you have a good fit
- ☐ Cut the wire so that it extends just beyond the joint on either side

Rivet: a metal pin used to hold two or more pieces of metal together.

- ☐ Carefully hammer the wire on one side then the other to create a rivet
  - Use the bench block/anvil to support the other end of the wire rivet
- ☐ Adjust the pin again if needed

Problem Solve:

- ☐ Assess the findings for possible problems
- ☐ If the solder has flooded onto the broach
  - Sand to remove the solder

- ☐ If the pin does not fit or the catch does not close
  - Remove the pin and adjust by cutting and filing the pin

If there are no problems, or you have fixed the problems, you can finish the broach (file, sand, polish and clean).

PENDANT - INTRODUCTION

Reading Text, Document Use, Oral Communication

Thinking Skills: Decision Making, Finding Information

As mentioned, if you are making a pendant, you will be using the techniques you have developed in your other projects. For example, you will need to follow the steps for soldering and using pickle, flux and polish. If you are making a chain you will need to follow the steps for making and soldering jump rings.

You will have a choice of sterling silver or copper for this project.

Please talk with your instructor to confirm the specific steps that you need to follow for your piece. They can also assist you in finding the information in your Student Notes.

You can use silver wire, jump rings or a bail (finding) to hang your pendant or you can incorporate your pendant into your chain.

Additional Steps for Making a Pendant:

- ☐ Decide how you want to hang your pendant
  - Consider the size of the chain
  - You can incorporate the hanging technique into your design, by creating or piercing a hole in the pendant
  - If you decide to use a bail you will need to solder the bail to the top or back of your pendant using a standard soldering technique

EARRINGS - INTRODUCTION

Reading Text, Oral Communication

Thinking Skills: Decision Making, Finding Information

As mentioned, if you are making earrings, you will be using the techniques you have developed in your other projects. For example, you will need to follow the steps for soldering and using pickle, flux and polish.

You will have a choice of materials for this project including silver, copper, wires, beads and found items. You can also make either stud or hanging earrings.

Note: It is important to consider that you need to use sterling silver for the posts or hooks (anything touching your ear). These pieces are called findings.

Please talk with your instructor to confirm the specific steps you will need to follow for your piece.

Work with your instructor to create your own design.

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EARRINGS – ATTACH HOOKS OR POST

Document Use, Numeracy

Thinking Skills: Problem Solving, Finding Information

Studs:

- ☐ Design and create your earrings
- ☐ Solder the posts onto the back of your earrings
  - Find and follow the same technique you would use to solder on a joint and catch of a broach

    http://www.firemountaingems.com/shopping.asp?skw=KWEARFANCYSTUDSS

Hooks:

- ☐ Decide on a method, style and hanging system
  - There are many different ways to hang earrings
  - You can use hooks/findings or you can use your imagination and think about how you can incorporate hanging into the design

http://www.firemountaingems.com/shopping.asp?skw=KWEARFISHSS


http://www.vdavidson.com

Congratulations you have finished your final projects!

Jewellery Resources Used Throughout Students Notes

www.hrsdc.gc.ca/eng/workplaceskills/essential_skills/general/home.shtml

http://www5.hrsdc.gc.ca/NOC/English/NOC/2006/Profile.aspx?val=7&val1=7344

http://www.meridianeng.com/msds.html

http://www.absoluteastronomy.com/topics/Millesimal_fineness

http://www.volcanoarts.biz/cart/metalsmithing/index.htm

http://www.hobbytools.com.au/prod87.htm

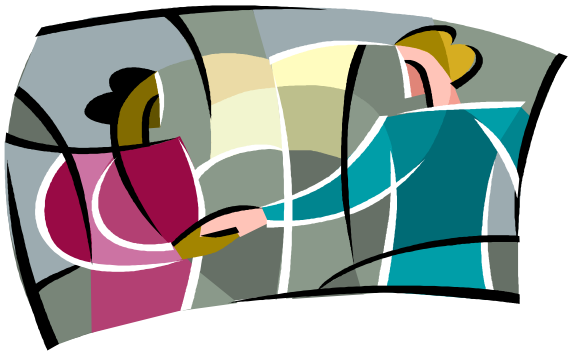
http://en.wikipedia.org/wiki/File:Drawplates.jpg

http://store.metalliferous.com/prodinfo.asp?number=TX1390

http://www.vdavidson.com/

http://www.ndesignsmetal.com/?p=662

valndave@nexicom.net



We hope you have enjoyed this jewellery making course.

On behalf of Literacy Ontario Central South, Literacy and Essential Skills in Industrial Arts (L.E.S.I.A.) project, we would like to thank you for your participation.

Best of luck with your future endeavours.