N5 Design & Manufacture

Metalworking Questions

Montrose Academy
What are two differences between ferrous and non-ferrous metals?

______________________________________________________________

______________________________________________________________

Name two products that aluminium is commonly used to make.

______________________________________________________________

______________________________________________________________

Circle two pure metals.

Aluminium  Steel  Brass  Tin  Copper  Bronze

What is an alloy?

______________________________________________________________

Below are a range of properties, and a description, that metals commonly have. Fill in the blanks, brittleness has been given as an example.

Brittleness  – Easily broken, when struck, with little or no bending at the breaking point

Ductility  – ______________________________________________________________

___________  – Ability to resist a force without breaking

Conductivity  – ______________________________________________________________

___________  – Able to be hammered out into thin sheets or small bars without cracking
Name the tools shown below.

________________________
________________________

________________________
________________________

Describe what a scriber is used for.

________________________

You need to mark a line parallel to the edge of your metal, what tool would you use?

Engineers Square  Odd Leg Calipers  Scriber

What is the metal lathe used for in metalwork?

________________________

________________________

________________________
Label the parts of the metal lathe shown below.

What is stored in the headstock?

Which of the following is used to move the tool post across the face of the work?

- Compound slide
- Cross slide
List 4 safety considerations when using the metal lathe.

- 
- 
- 

Which of these pictures shows the correct way of setting up lathe tools? Tick the correct box.

On the following diagrams, draw an arrow to show the direction the cutting tool moves when: Parallel turning; Facing off; and Taper turning.

**Parallel Turning**

**Facing Off**
Taper Turning

What is a knurling tool used for?

________________________________________________________________________

________________________________________________________________________

What parts of items have knurled surfaces?

________________________________________________________________________

________________________________________________________________________

What is the purpose of facing off?

________________________________________________________________________

________________________________________________________________________

Notching is a process which involves the removal of material from a sheet of metal name one tool that could be used the following environments.

Industrial work place -

________________________________________________________________________

A school workshop -

________________________________________________________________________

Some metal can be bent using an engineers vice, folding bars and a hide mallet. Explain why a hide mallet is used.

________________________________________________________________________

________________________________________________________________________
A piece of metal requires bent and notches to be removed, which of these should be done first and why?

________________________________________________________________________

________________________________________________________________________

Name the two tools shown in the picture below.

__________________

__________________

There are a number of different types of mallet that can be used during the shaping and bending of metals, please name another two.

__________________

__________________

Some metals need to be heated to soften them up before they can be shaped or bent, what is this process called?

________________________________________________________________________

When shaping sheet metal a wooden former could be used, give two advantages to using a wooden former.

•

•
Forging metal

1. Name four pieces of essential safety equipment required to be worn while working on the Hearth.
   a. ___________________________________________________________
   b. ___________________________________________________________
   c. ___________________________________________________________
   d. ___________________________________________________________

2. Why are parts formed via forging stronger than those formed via casting?

3. Label the following picture with the correct names.

   Extraction Hood
   fire bricks
   Brazing Station
   Torch
   Blacksmiths/chip Forge
   Tongs

4. What does the hearth use to provide heat?
   ___________________________________________________________

5. How might you increase the size and heat of the flame produced from the torch?
   ___________________________________________________________
6. Why might fire bricks be arranged in a semi circle around an object?
   ____________________________________________________________
   ____________________________________________________________

7. What would you use to hold hot metals securely?
   ____________________________________________________________
   ____________________________________________________________

8. Label the following diagram correctly.

![Diagram of an anvil]

9. How might you use a Hardie?
   ____________________________________________________________

10. The Swage and Fuller are other tools that use the Hardie Hole, what is their purpose?
    ____________________________________________________________

11. Why might you have to use a Flatter after using a Fuller?
    ____________________________________________________________

12. Why does the pein on a straight pein hammer run parallel to the handle?
    ____________________________________________________________

13. What is the purpose of the round Pein on a Ball Pein Hammer?
    ____________________________________________________________
14. Once heated, a piece of metal can be worked using the anvil and hammer in order to taper it to a point. What is this process called? 
__________________________________________________________

15. Describe how you would use an anvil to bend a piece of metal.
__________________________________________________________
__________________________________________________________
__________________________________________________________

16. What does it mean to upset a piece of metal?
__________________________________________________________
__________________________________________________________
__________________________________________________________

17. Name two forms of punching metal.
__________________________________________________________

18. Name the three main stages of the heat treatment process and describe why they are important.
   a. _________________________________________________________
   ____________________________________________________________
   b. _________________________________________________________
   ____________________________________________________________
   c. _________________________________________________________

19. What heat treatment requires the metal to be heated until bright red then allowed to cool naturally?
__________________________________________________________

20. What is the purpose of this process?
__________________________________________________________

21. Describe the difference between Hardening and tempering.
__________________________________________________________
__________________________________________________________
__________________________________________________________

22. What happens when a metal becomes Work Hardened?
__________________________________________________________
__________________________________________________________
__________________________________________________________
Cutting Tools

1. Describe the difference between a Hacksaw and a Junior Hacksaw
   __________________________________________________________________________
   __________________________________________________________________________
   __________________________________________________________________________
   __________________________________________________________________________

2. What tool would be useful for cutting curved shapes into a piece of metal?
   __________________________________________________________________________

3. Why would this tool be better than a Hacksaw for cutting curved shapes?
   __________________________________________________________________________
   __________________________________________________________________________
   __________________________________________________________________________
   __________________________________________________________________________

4. Describe the operation of Snips.
   __________________________________________________________________________
   __________________________________________________________________________
   __________________________________________________________________________
   __________________________________________________________________________

5. When might you use Snips instead of a Hacksaw?
   __________________________________________________________________________

6. Describe the process of shearing metal using a cold chisel.
   __________________________________________________________________________
   __________________________________________________________________________
   __________________________________________________________________________
   __________________________________________________________________________

7. Describe the difference between Pliers and wire cutters.
   __________________________________________________________________________
   __________________________________________________________________________
   __________________________________________________________________________
Finishing metal

1. Why do you need to finish metal after it has been cut?

2. What is the purpose of a file?

3. Why are files most efficient when pushed?

4. Why should you avoid pulling files?

5. Why might you require a file card?

6. Why is it advantageous to use emery cloth rather than paper-backed abrasives when working with metals?

7. What is the purpose of wetting wet and dry paper?

8. What is metal polish?

9. What can metal polish be used to remove?
10. What can be used to ensure metal remains shiny?

__________________________________________________________

__________________________________________________________

11. Describe two methods of protecting ferrous metals?

__________________________________________________________

__________________________________________________________

__________________________________________________________
Holding tools

1. What can be used with the engineer’s vice to allow you to work with plastics and soft metals?

2. Why do engineer’s vices overhang the edge of the workbench?

3. What is a machine vice used for?

4. What is the purpose of the v shaped grooves in the jaws of the machine vice?

5. When might you use a hand vice?

6. What do folding bars allow you to achieve?

7. Describe the operation of mole grips.
Drilling metal

1. Before drilling any metal it must be _____________________________

2. What three tools can be used to mark out the position of a hole to be drilled?
   __________________________________________
   __________________________________________

3. Why would you use a centre punch prior to drilling?
   __________________________________________

4. Why might the drill bit break as a result of sideways movement?
   __________________________________________
   __________________________________________

5. How should you hold metal to be drilled?
   __________________________________________
   __________________________________________
   __________________________________________

6. What kind of drill bit should be used when drilling metal?
   __________________________________________

7. Describe Swarf and how it may be removed?
   __________________________________________
   __________________________________________
   __________________________________________
**Sand Casting**

Label the parts of the casting box shown.

Sprue pins are used to create channels for the molten metal to be poured. What are the names of these channels? What are these channels used for?

<table>
<thead>
<tr>
<th>Name of the channel</th>
<th>What is it used for?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The pattern has to have sloping sides on it. Why is this?

__________________________________________________________________________________

__________________________________________________________________________________

What do you have to sprinkle over the pattern before putting sand over it?

__________________________________________________________________________________

__________________________________________________________________________________

How do you know when to stop pouring the metal?

__________________________________________________________________________________

__________________________________________________________________________________
## Die Casting

When should die casting be used instead of sand casting?

What is the mould made from in die casting?

Explain, in your own words what happens in the process of die casting.

<table>
<thead>
<tr>
<th>Die Preparation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Injection</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Ejection</td>
</tr>
<tr>
<td>----------</td>
</tr>
<tr>
<td>Shakeout</td>
</tr>
</tbody>
</table>
Complete the table below.

<table>
<thead>
<tr>
<th>Advantages of Die Casting</th>
<th>Disadvantages of Die Casting</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</table>
**Dip Coating**

What is dip coating?

What safety equipment has to be used when dip coating?

Explain the process of dip coating.
Metal can also be coated with a number of different materials to protect it.

<table>
<thead>
<tr>
<th>Painting</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Spray painting</td>
<td></td>
</tr>
<tr>
<td>Lacquering</td>
<td></td>
</tr>
<tr>
<td>Process</td>
<td></td>
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<tr>
<td>--------------</td>
<td>---</td>
</tr>
<tr>
<td>Dip Coating</td>
<td></td>
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<tr>
<td>Galvanising</td>
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<tr>
<td>Bluing</td>
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</tbody>
</table>
## Joining Metal

Put the following methods of joining metal into the table. Indicate whether each method is permanent or non permanent.

<table>
<thead>
<tr>
<th>Method of joining metal</th>
<th>Process or tool for joining metal</th>
<th>Permanent</th>
<th>Semi permanent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Adhesives</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Mechanical fixing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Soldering</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Epoxy Resin
- Solid Rivets
- Pop Rivets
- Nuts
- Bolts
- Machine Screws
- Washers
- Self tapping screws
- Threading
- Soldering
- Brazing
- Welding
- Arc Welding
- Spot Welding
### Knowledge questions

#### 4. Brazing

#### 5. Welding

Name the rivets below.

![Images of rivets]

_________  ___________  ___________  ___________

Apart from speed of use, name one advantage of using pop rivets over solid rivets.

________________________________________________________________________

________________________________________________________________________

How does this advantage effect mass production techniques?

________________________________________________________________________

________________________________________________________________________
Nuts, Bolts & Machine Screws

What is a nut used for?

What does a nut have to be used alongside?

What is one advantage of using a wingnut?

What is the difference between a bolt and a machine screw?

What is a washer?

Why are self tapping screws made of hardened steel?
Name the driving tools shown below.
**Taps & Dies**

What are Taps used for?

What is the name of this tool and what is it used for?

Name each of the types of taps available and describe the use of each one.

<table>
<thead>
<tr>
<th>Name of tap</th>
<th>Use</th>
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</thead>
<tbody>
<tr>
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</tbody>
</table>
National 5 Design & Manufacture

Knowledge questions

What is meant by a blind hole?

What are Dies used for?

What is the name of this tool and what is it used for?

Why do we chamfer a metal rod before cutting an outside thread in it?

What should we use to help us cut this thread?
**Soldering, Brazing & Welding**

What tools are used when soldering and does this happen at low, medium or high temperatures?

What tools are used when brazing and does this happen at low, medium or high temperatures?

What is stronger; welding, brazing or soldering?

What can happen if the settings on an arc welder or spot welder are incorrect?
What needs to be produced before a rapid prototyping model is created?

________________________________________________________________________
________________________________________________________________________

Name the advantages of using rapid prototyping to make models.

1. ______________________________________________________________________

2. ______________________________________________________________________

3. ______________________________________________________________________

4. ______________________________________________________________________

5. ______________________________________________________________________

6. ______________________________________________________________________

7. ______________________________________________________________________