

METALWORK AND WELDING

6188
Paper 1

General Comments

It was encouraging to note that the total entries of candidates have increased from 104 in 2020 to 175 in 2021. This demonstrates the demand of Metalwork and welding in the Namibian society. During the national marking it could be observed that all candidates who sit for the examination completed within the given timeframe. The Chief marker would like to encourage centres to continue the good efforts to the benefit of the Namibian child despite various challenges at different centres. It is strongly advised for centres to expose candidates to regular practical activities from as early as from the Junior Secondary phase in order to get them thoroughly prepared for the NSSCO external examination. It was evident during the marking session that centres still struggle to correctly answer questions that require candidates to describe a process, e.g. soldering process, brazing process, drilling process, etc. These processes can only be mastered if candidates are allowed to perform these processes practically.

Section A

Answer **all** the questions.

1 (a) This question was well answered by almost all centres:

- (i) Loose clothing and jewelry
Avoid loose / hanging clothing
Remove rings and necklaces. (Any 2) [2]
- (ii) Inadequate guards over machinery.
Do not use machine without guards, it could cause serious accidents.
Ensure guards are in place; guards are functional (Any 2) [2]

2 (a) (i) The question was well answered even though some candidates did not know the properties of tool steel.

Uses: A scribe is a hand tool used in metal work to mark lines on work pieces, prior to machining [1]
Property: toughness, hardness (Any 1) [1]

(ii) Well answered. Expected answer is:

Allows hand and fingers to get a better grip on the scribe in order to use it comfortably [2]

3 (a) Well answered:

It is caused when you hit the head of a chisel with a hammer so that the head (opposite the point) gets deformed to look like a mushroom [1]

(b) Well answered:

Trim the mushroom off and work around the mushroom by grinding it evenly.
Grind the head or striking end at an angle to create a chamfer [2]

4 (a) Well answered by most candidates:

- 1 Angle Grinder, Bench grinder
2 Files (Any two) [2]

5 Well answered:

- Appropriate improvements shown [1]
- Suitable joints [1]
- Relevant notes [1]

6 Most candidates did not know the correct name of the power tool. Circular saw was among the answers given.

(a) Cut off tool/ cut off saw [1]

(b) This question was answered moderately. PPE was considered as correct:

- Locate and ensure you are familiar with all machine operations and controls. Ensure all guards are fitted, secure and functional. Do not operate if guards are missing or faulty.

- Ensure the saw is properly secured to a worktable by bolts/clamps at approximately hip height.
- Ensure the saw is operated on an RCD protected circuit.
- Use abrasive cut off wheels with the correct size arbor hole.
- Use abrasive cut off wheels with a maximum safe operating speed greater than the “no load RPM” marked on the machine’s nameplate. Inspect the cut off wheel for chips and cracks.
- Check workspaces and walkways to ensure no slip/trip-hazards are present.
- Ensure the depth stop is properly adjusted.
- Keep table and work area clear of all tools and off-cut material. (Any two) [2]

7 (a) **Only candidates from three centres could give the correct of the marking tool:**
Trammel [1]

- (b) Trammel heads are used in layout work to scribe circles and arcs that are too large to be drawn with a divider or compass.
- Trammel heads can also be used to bisect lines and angles.
 - They can be used as an alternative to both a marking gauge and a mortise gauge to draw lines a set distance from an edge (Any two) [2]

8 (a) **Only a few candidates could state the correct name:**
Spot welder [1]

- (b) **Almost all centres were unable to describe the process of operations:**
The process uses two shaped copper alloy electrodes to concentrate welding current into a small “spot” and to simultaneously clamp the sheets together. Forcing a large current through the spot will melt the metal and form the weld. [3]

9 **Poorly answered which is an indication that centres do not pay much attention to properties and uses of metals:**

Metals	Properties	Uses
Stainless steel	iron has very good corrosion resistance, high strength and durability, toughness, (2) (Any 2)	Kitchen sinks, ovens, cutlery (knives, spoons) (1) (Any 1)

10 Brittleness [1]
[30]

Section B

11 (a) **Almost all centres did not know the correct soldering process:**

(i) - Soldering requires 2 main things: a soldering iron and soft solder.
- A clean surface is very important if you want a strong, low resistance joint.
- Clean the tip of the soldering iron on wet paper towel.
- Apply Heat an apply Solder (Any three) [3]

- (ii) **Almost all candidates did not know the correct brazing process:**
- Ensure good fit and proper clearances.
 - Clean the metals and flux the parts.
 - Assemble parts for brazing and braze the joint.
 - Clean the brazed joint (Any three) [3]

(b) **Candidates answered this question poorly:**
Hold the folding bar in the vice. Secure the measured and marked piece with folding bar securely in a bench vice. Use a rubber mallet to shape the sheet metal to 90 degrees. A rubber mallet is used to prevent markings on metal. [4]
[10]

12 (a) **Well answered:**
(i) bolt and nut [1]

- (ii) **Well answered:**
A: Thread
B: Shank
C: Head [3]

- (iii) **Poorly answered:**
- D: Steel composition [1]
 - E: Alloy group designation [1]
 - F: strength properties [1]

(b) Very few candidates answered question i-iii correctly:

- (i) Stick welding is formed by striking an electric arc between a metal electrode and the work piece. The electric current passes through the electrode and melts it into work piece and forms a weld pool. [1]
- (ii) MIG Welding is formed with solid wire electrodes fed through a welding gun and into the weld pool. Joining two base materials together. A shielding gas is also send through the welding gun and protects the weld pool from contamination. [1]
- (iii) TIG Welding uses the heat generated by an electric arc between the metal to be joined and an infusible tungsten – base electrode located in the welding torch. The arc area s throuded in an inert or reducing gas shield to protect the weld pool and the tungsten electrode. [1]

[10]

13 (a) Once again candidates were unable to describe the process correctly:

Measure and mark both square tubes to 45 degrees. Hold it securely in the bench vice and cut with a grinder. Remove burrs with an angle grinder/ bench grinder/file. [3]

(b) Almost all candidates could not answer this question correctly. Instead of showing how to hold the joint in a holding device, candidates drew a corner joint without a holding device.

- Appropriate improvements shown [1]
- Suitable joints [1]
- Relevant notes [1]

[3]

(c) Centres had no idea what metal plating refer to. No centre answered this question correctly:

Metal Plating: Plating is a process in which a thin layer of metal coat is applied to a metal. This is achieved through electro plating; it requires an electric current through electrodes plating which is an autocatalytic chemical process. [4]

[10]

14 (a) This question was answered by almost all centres:

- Fillet weld drawn
- Fillet weld drawn correctly
- Welding symbol shown
- Welding symbol drawn correctly [4]

(b) Again most centre were unable to write the correct causes of the two welding defects in (i) and (ii):

- (i) - Incomplete penetration is generally caused by a very low travel speed and attempting to make too large a weld in a single pass.
 - However, it is also very often caused by too low a welding voltage.
 - As a result, the wetting of the bead will be poor. (Any two) [2]
- (ii) Welding crater is the unfilled end of a weld and forms during the final solidified weld pool and is often associated with some gas porosity. This imperfection results from shrinkage on weld pool. [2]

(c) Well answered:

Test A: produces more sparks which is a result of high carbon content in the metal.
 Test B: produces less sparks compared to Test A which indicates less carbon content in the metal [2]

[10]

15 (a) Well answered by almost candidates:

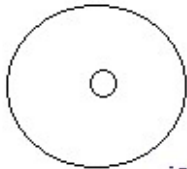
- (i) rightward welding (backward welding)
1. It is faster and uses less filler rod, so it is less expensive.
 2. There is less expansion and therefore less contraction.
 3. The flame remains over the deposited metal, giving an annealing action.
 4. A better view of the molten pool is obtained, allowing for greater control of the welding operation. [3]

- (ii) - Completely shut both torch valves
- Check the regulator setting and cylinder pressures
- Relight in accordance with above procedures. (Any three) [3]

(b) Poorly answered by almost all candidates. The correct nozzles are shown below:



- Cutting nozzle drawn correctly (1)
- Has multiple ports (1) [2]



- Welding nozzle drawn correctly (1)
- has single port (1) [2]

[10]

16 Correctly answered since it is a question meant for below averaged candidates to score marks:

A has the highest content
Reason: Force applied is unable to compress the metal further than it shows. [2]

(b) Very few candidates could score marks for question (i) and (ii). Centres should give more attention to metal properties and uses from Junior secondary phase:

(i) Duralumin

Uses:

- It is used for making wire, bar and rods for the screw machine products
- It is used in heavy-duty forgings, wheels, plates, extrusions, aircraft fittings, space booster tankage and truck frames, and other suspension components. It finds applications in places where high strength is required, and services at elevated temperatures.
- It is used for making Aircraft structure, truck wheels, screw machine products, rivets and other structural application products. (Any two) [2]

Properties:

- Duralumin alloys are soft, ductile and workable when they are in normal state.
- They can be easily rolled, folded or forged.
- They can also be drawn into a variety of shapes and forges.
- It has a high strength, which can be easily lost during welding.
- So it can be easily transformed, and hence is used in aircraft construction.
- It is suited for aircraft construction because of its lightweight and high strength. (Any two) [2]

(ii) High Speed steel

Uses:

- Hand tools, such as chisels, punches, hammers etc.
- Machine tools for cutting metals.
- Shears for cutting materials.
- Dies for deep drawing, extrusion, forging etc.
- For the manufacturing of drills, milling cutters, hobs, broaches, (Any two) [2]

Properties

- The main characteristic of high speed steel is that it maintains hardness at temperatures up to 550°C.
- Possess high wear resistance.
- It is hard steel and cannot be machined by ordinary methods.
- It allows the tool to cut the metal at high speed.
- Corrosion resistant (Any two) [2]

[10]

17 Question (i) and (ii) was well answered by almost all candidates and below average candidates could collect valuable marks:

- (i) - Holding device drawn (1)
- Device suitable for purpose (1)
- Appropriate rendering (1)
- Appropriate Notes (1)
- Tools, materials, processes indicated (1)

[5]

- (ii) - Locking mechanism drawn (1)
- Device suitable for purpose (1)
- Appropriate rendering (1)
- Appropriate Notes (1)
- Tools, materials, processes indicated (1)

[5]

[10]

[100]