Design & Technology
A-Level

Machining
Multiple Choice

Materials required for questions

- Pencil
- Rubber
- Calculator

Instructions

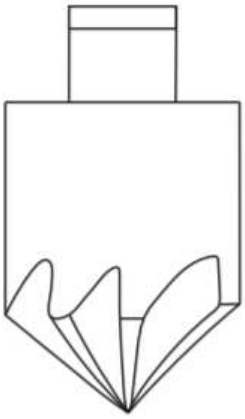
- Use black ink or ball-point pen
- Try answer all questions
- Use the space provided to answer questions
- Calculators can be used if necessary
- Use a cross in the box to mark you answer 

Advice

- Marks for each question are in brackets
- Read each question fully
- Try to answer every question
- Don’t spend too much time on one question

Good luck!

Q1. Which type of drill is shown below?

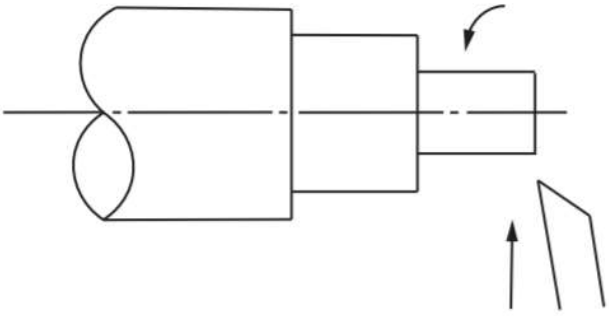


A Countersink ☐

B Twist ☐

C Masonry ☐

Q2. Which turning process is shown in the diagram below?



A Parting off ☐

B Facing off ☐

C Taper turning ☐

Q3. Which one of the following tools is an abrading tool?

A Plane ☐

B File ☐

C Twist drill ☐

Q4. Which piece of safety equipment should be worn when using a pillar-drilling machine?

A Ear defenders ☐

B Goggles ☐

C Heat protective gloves ☐

Q5. A screw thread M8 x 1.2 is to be cut in a metal block. What size hole must be drilled before the thread can be cut?

A 9.2mm ☐

B 8mm ☐

C 6.8mm ☐

Q6. Which one of the following processes involves the use of heat?

A Vacuum forming ☐

B Laminating ☐

C Turning ☐

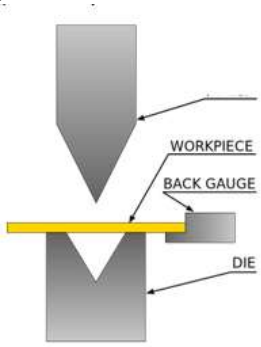
Q7. In which order would you drill a hole with a countersink profile for a screw?

A Drill, screw, countersink ☐

B Countersink, screw, drill ☐

C Drill, countersink, screw ☐

Q8. The figure below shows the machining method of pressing, there is a label missing in the figure.



Which one of the following is the correct label?

A Drill ☐

B Drive centre ☐

C Punch ☐

Q9. Name one box process used to remove waste material to make different parts of a prototype. Describe the process you have chosen. **(3 marks)**

Name of process:

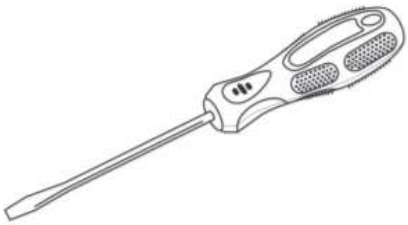
Description of chosen process:

Q10. The image below shows a desk lamp.
Give 2 properties of brass that make it suitable for the base of the desk lamp. **(2 marks)**

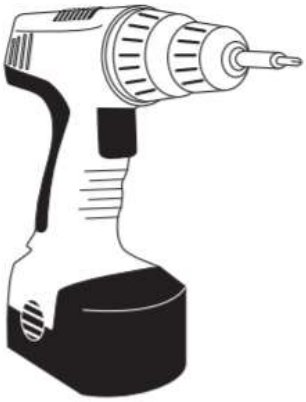
1.

2.

Q11. The drawings below show two different types of workshop tool.



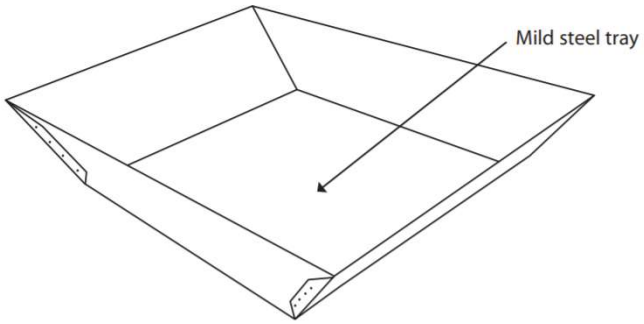
Screwdriver



Cordless drill

Evaluate the screwdriver compared with the cordless drill in terms of: 1.Materials and components 2. Function **(6 marks)**

Q12a. The wheelbarrow tray is made from mild steel



Explain 2 advantages of making the wheel barrow tray from mild steel **(4 marks)**

1.

2.

12b. Explain one way in which materials can be reduced in the manufacture of the wheelbarrow. **(2 marks)**

Q13a. Mild steel weights are turned on a centre lathe
Give 3 risks associated with turning on a centre lathe **(3 marks)**

1. _____

_____

2. _____

_____

3. _____

_____

13b. The table below shows two of the turning processes used to manufacture the mild steel weights.

Complete the table by naming the correct process from the description and process given. **(2 marks)**

Process description		**Process name**
The tool us moved at right angles to the work		
The tool is moved along the centre axis to reduce the diamter		

Q14. The figure below shows the front panel of a speaker cabinet
State one suitable drill bit you would use in a pillar drill to make hole A. **(1 marks)**

_____

Answers

Q1. A
Q2. B
Q3. C
Q4. B
Q5. C
Q6. A
Q7. C
Q8. C

Q9.

Indicative content:
1 mark for a named process:

- Die cutting
- Perforation & punching
- Turning
- Sawing
- Milling/Routing
- Drilling
- Cutting - including laser cutting
- Shearing.
- Abrasive removal e.g. sanding, filing
- NB RECYCLING AND WASTE MANAGEMENT IS INCORRECT

- 1 mark for a simple descriptive point
- 2 marks for a detailed response with two credit worthy points made

Process	**Description of a situation of use**
Laser cutting	Information output from sources like 2D design can instruct laser to cut precisely, avoiding human error, repetitive design usually working with acrylic, plywood and card. Possible reference to setting up laser , x and y coordinates, focusing, cutting speed, power settings and extraction.
Die cutting	Used to remove a net or multiple nets from a piece of card in one operation. Process involves

	using knives, creasing bars and perforation blades. Used in the production of card packaging.
Perforation and punching	Perforating is where small localised areas of material are removed (paper, card & corriflute) to weaken the material to allow a controlled tear to take place, eg tissue box opening. Punching uses a die to 'punch' out a hole or shape of material to form a hole or an opening. Takes place on sheet material.
Turning	Involves using either a wood lathe or a metal work lathe to remove portions of material from a rotating work piece to produce a concentric profile, eg stair case spindles, metal cylinders and wooden bowls.
Sawing	Sawing takes place using one of a range of: Hand saws appropriate to a specific material or to cut straight or curved cuts, eg hacksaw (metal) dovetail saw (wood) coping saw (curved cuts in wood) Machine saws, eg band saw, fret saw and circular saw for removal of material more rapidly to cut out several or possible larger parts from a chosen material.
Milling/CNC milling	Vertical milling (common in school) and horizontal milling. Vertical milling allows slots as well as holes to be cut in materials like aluminium with ease. Horizontal milling allows large flat surfaces to be machined removing surface defects from such processes as casting.
Drilling	Production of a hole either through or blind using a twist drill or similar. Process can be complete using a hand drill, cordless drill, electric drill or pillar drill.
Cutting	Rotary cutters can be used to cut multiple layers of fabric with accurate straight or curved lines. Seam ripper has a sharp internal blade between two prongs and is used to unpick seams.
Shearing	Using shears or tailors shears to cut fabrics. The long blades help make cutting straight lines a more accurate and faster process. Specialist pinking shears are used to cut fabrics prone to

	fraying. The characteristic 'zig zag' edge can also be used as a decorative feature. A guillotine uses a shearing action to cut paper, card and sheet metals Thread snips are mini shears used for cutting embroidery threads. They can also be used as seam rippers.

Q10.

Two properties given from:

- Excellent resistance to corrosion (1)
- Tough (1)
- Can be polished to achieve a high lustre (1)
- Turns well on a lathe/machinability (1)
- Casts well / good fluidity (1)
- High density / heavy (1)
- Durable (1)
- Good heat resistance (1)
- (Do not accept good conductor of heat / electricity / strong)

2 x 1

Q11.

Evaluation to address the following issues: Materials and components

What materials and components are needed and how should they perform?

Screwdriver	Cordless drill
• Only two separate components are required • The steel blade needs to be hard and heat treated • The plastic handle should be an electrical insulator • The blade can be moulded directly into the plastic handle • The handle should provide a good grip • Easier to recycle / fewer bits / parts	• There are lots of separate components which make this an expensive product / more things to go wrong • The battery should be easy to recharge and have a long life • The materials should be tough and capable of withstanding knocks and bumps • The gears should allow different speeds to be achieved • The switch lever underneath allows the direction to be changed

OK to accept comments about cost and environment under this heading if the comparison is based on respective number of component parts / cost of assembly

Function

What is the product for?

Screwdriver	Cordless drill
• Limited function, can only be used for putting in / taking out flat head screws • Sometimes abused to open tins of paint • Requires more manual effort to turn and rotate than the cordless	• Can be used to drill holes with the appropriate drill bit • Can be used with a countersink bit to recess sections for screws to go in • Can be used with different bits to put in / take out different types of screws • Can tighten / undo better than by hand • Can be used at different speeds / torque settings

Q12a.

Two advantages explained from:

• No expensive mould/machine is required (1) which means that it will be cheaper (1)

• Easy to recycle (1) which means less likely to be thrown away/added to landfill (1)

• Easy to make different shapes and sizes (1) because there is no mould (1)

• Bits can be pressed/stamped out (1) and then joined easily by welding/riveting (1)

• Mild steel is tough (1) which means it can withstand knocks / bumps(1)

• Mild steel is hard (1) which means it can withstand wear (1)

• Easily welded (1) can be repaired/patched up (1)

• High compressive strength (1) makes is capable of taking/carrying weight
(1)

• Relatively cheap (1) keeps material costs down (1)

• Widely/readily available (1) making is easy to get (1)

• Malleable (1) which means it can be pressed/folded into shape (1)

Do not accept ‘Strong’ or ‘Durable’.
2 x 1
2 x 1

12b.

One advantage explained from:
• Thinner / lighter sections (1) will need less material (1)
• Fabricating the shape (1) will mean smaller pieces can be joined together (1)
• Lay planning/ nesting / tessellations (1) will mean less waste (1)
• Making it smaller/changing shape (1) will use less material (1)
• Use CAD/CAM (1) to lay plan/laser cut (1)
• Use templates to aid marking out (1) to minimise material waste (1)
• It could be pressed (1) from a single piece/shape (1)
• Use less/fewer components (1) and weld bits/pieces together (1)

Do not accept anything related to recycling/strong.
2 x 1

Q13a.
Three risks given from:
• Chuck key/work flying out (1)
• Bits flying off into your eyes / work coming out (1)
• Tie / hair /clothing getting caught (1)
• Tool banging into chuck (1)
• Cuts from swarf / waste material (1)
• Hot bits of metal / work burning you (1)
• Fingers/ hands caught/trapped/injuries (1)
3 x 1

Q13b.
Two processes named:
• Facing / facing off (1)
• Parallel turning (1)

Q14.

- Hole cutter/drill
- Flat (wood) bit
- Combination hole saw

- Forstner bit
- Auger bit
- Spade bit
- Taper shank twist drill
- Centre bit with screw nose
- Sawtooth bit
- Tank cutter
- Trappaning tool
- Expansive bit