DTBase©

Design & Technology
AQA GCSE

Specialist tools and equipment

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
- For the multiple choice questions, circle your 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. Why is it important to choose the correct specialist tool for a specific material or task?

A To make the work more artistic

B To improve speed only

C To achieve a high-quality and accurate outcome

Q2. What is a key reason for using digital design and manufacture (e.g. CNC machines)?

A To add extra colour

B To reduce the use of electricity

C To produce precise, repeatable components

Q3. Which of the following is a specialist hand tool commonly used for shaping wood?

A Soldering iron

B Tenon saw

C Pillar drill

Q4. What must always be considered before using a piece of machinery?

A Whether it looks new

B Whether there is enough paint

C Whether all safety checks have been done and PPE is used

Q5. The images in the table below are of specialist pieces of Design and Technology equipment.

		
Laser cutter	**Overlocker**	**Vacuum former**
		
Centre lathe		**3D Printer**

Choose one piece of specialist equipment from the table.

My chosen piece of equipment is: _____

Q5a. Describe how your chosen piece of equipment is used. **(3 marks)**

_____

_____

_____

_____

_____

Q5b. Explain the checks you would make to ensure the equipment is able to produce quality outcomes. **(3 marks)**

Q6. Computer based tools are helpful to designers when modelling. Discuss how a designer might use computer based tools in the development of a product. **(6 marks)**

Answers

Q1. C
Q2. C
Q3. B
Q4. C

Q5a.

Equipment	**How is chosen equipment used?**
Laser cutter	• A Cad files eg DFX is sent from a PC to the laser cutter • Put material into laser cutter to reference point • Laser is focussed so you can minimise waste, cut accurately and tesselate many parts. • Go int into settings appropriate to material • Lid closed and press start.
Overlocker	• Place the threads at at back of machine • Put fabric under presser foot to be joined. • Run machine to join fabric together • Make sure there is a chain of stiches that run into the air before cutting off.
Vac former	• Turn on heating elements • Former or similar into the machine bed • Plastic sheet clamped into position • Heaters pulled over plastic sheet to soften it • Raise table • Turn on Vacuum • Blow former to ease removal of workpiece • Lower table once formed • Remove former from workpiece
3D printer	• Create a 3D prototype representation of any file, (STL or VRML), product sent from a CAD output. • Prepare the bed for printing • Upload STL file etc • Machine extrudes molten filament precisely • Remove 3D image from bed removing any scaffolding if used
Lathe	• Create a 3D prototype representation of any file, (STL or VRML), product sent from a CAD output.

	• Prepare the bed for printing • Upload STL file etc • Machine extrudes molten filament precisely • Remove 3D image from bed removing any scaffolding if used

Q5b.

Equipment	**How is chosen equipment used?**
Laser cutter	• Correct software installed • Laser lens clean – keep the beam focused. • Focus the laser – so beam is focused on the surface of the material being worked. • Check speed, PPI and power of laser to ensure line is cut through, engraving sufficient depth.
Overlocker	• Four threads in place – overlocking stitches can be formed. • Chain of stitching formed – machine is ready to stitch fabric. • Thread tension settings are suitable for fabric type – stitches will be correctly formed without puckering fabric or threads snapping. • Quality of stitching – stitches will be neat and correctly formed. • Thread colour – to match selected fabric. • Produce a test sample
Vac former	• Former/jig/mould/template in correct place • Sheet correct way round eg shiny side up • Vacuum forming seals are working. • Appropriate pin holes in former to ensure all air can escape from around the former. • Temperature correct – so material is soft and flexible.
3D printer	• Check factory settings first if new. Do not assume print bed is level. • Nozzle clearance to the bed. • Nozzle temperature is appropriate to melt PLA filament or similar. • Correct printer software is installed.

	• Correct bed dimensions are installed so PLA is not printed where it should not. • Do a test print
Lathe	• Component secure and central in the appropriate chuck. • Tool post height is correct, so tool tip is in line with centre axis of component being worked. • Correct rotation speed to avoid excessive heat and vibration reducing quality of surface finish dependant on material being worked and its diameter. • Ensure DRO (Digital Read Out) is set to zero.

Q6.
Indicative content: Students are likely to focus on CAD and CAM.

CAD:

- Internet – materials research and existing product research.
- Social media – potential customer/client/end user opinion.
- Shape /form – see what the final product might look like in the real world eg different surfaces finishes, views from different positions.
- Non-destructive testing – avoid wasting unnecessary materials to find out how a material/part/product may perform when in use.
- Share – ability to shape information worldwide instantly eg CAD file.

CAM:

- Accuracy – make a scaled or full size mock-up of a final part/component etc without wasting more expensive material.
- Rapid prototyping – accurate and fast replication of a CAD design in a modelling material eg PLA.
- CNC machinery eg 3 axis miller to realise a virtual realisation of a component/part/product.
- Testing – check settings for CAM to ensure the settings are correct before final manufacture eg laser – power/speed/PPI in the 'real' material.