DTBase©

Design & Technology
Eduqas GCSE

Using 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. What does COSHH control?

A Hazardous substances such as adhesives, solvents, resins and dusts

B The noise level of machines

C The price of tools

Q2. What is a risk assessment?

A A list of the tools needed for a job

B Identifying hazards, who could be harmed and the control measures needed

C A test of how strong a product is

Q3. Which of these is digital design and manufacture equipment?

A Coping saw

B Pillar drill

C Vinyl cutter

Q4. Which of these is workshop machinery rather than a hand tool?

A Pillar drill

B Craft knife

C Tenon saw

Q5. Which is a disadvantage of specialist tools and equipment?

A They reduce human error

B They require training and supervision

C They improve consistency

Q6. Which law says employers (and schools) must provide a safe place to work?

A PPE Regulations

B COSHH

C Health and Safety at Work Act 1974

Q7. Choose one of these pieces of specialist equipment: laser cutter, overlocker, vacuum former, 3D printer or centre lathe.

Q7a. Describe how your chosen piece of equipment is used. **(3 marks)**

Q7b. Explain the checks you would make to ensure the equipment is able to produce quality outcomes. **(3 marks)**

Q8. A sweet dispenser is made from 5 mm thick MDF with a 70 mm × 70 mm square window cut out of its front panel. Use sketches and notes to show how the window could be cut out and the edges made flat and smooth using hand and/or machine tools. Name all the tools and equipment used. State one safety precaution that must be taken. **(5 marks)**

Q9. Give five safety precautions a user needs to consider when using any cutting tools. **(5 marks)**

Q10. Give five safety precautions a user needs to consider when using tools and equipment that use heat. **(5 marks)**

Q11. Health and safety in a design and technology department is important to make sure everyone is protected from accidents. With reference to at least one material area you are familiar with, identify: the possible hazards associated with your chosen material area; actions to minimise risk; promotion of safe use. Give specific examples to support the points you make. **(8 marks)**

Q12. State two health and safety precautions, other than Personal Protective Equipment (PPE), that should be taken when constructing a printed circuit board (PCB). **(2 marks)**

Answers

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

Q7a.

3 marks: thorough understanding, two or more detailed points, or one detailed and two simple points. 2 marks: one point in detail or two simple points. 1 mark: one simple point. For example:

- Laser cutter: a CAD file (e.g. DXF) is sent from a PC; the material is put in to the reference point; the laser is focused so it cuts accurately and parts can be tessellated; settings chosen for the material; lid closed and start pressed
- Overlocker: threads placed at the back of the machine; fabric put under the presser foot; machine run to join the fabric; a chain of stitches runs into the air before cutting off
- Vacuum former: heaters on; former placed on the bed; plastic sheet clamped in position; heaters pulled over to soften the sheet; table raised; vacuum on; air blown to ease removal; table lowered and former removed
- 3D printer: an STL file from CAD is uploaded; bed prepared; the machine extrudes molten filament precisely; the print is removed from the bed and any support (scaffolding) removed
- Centre lathe: material prepared and fixed in the chuck; tool height set to centre; correct speed chosen; guard down before starting; coolant on for a metal lathe

Q7b.

3 marks: detailed explanation of check(s). 2 marks: one detailed check or two simple checks. 1 mark: one simple check. For example:

- Laser cutter: correct software installed; lens clean and laser focused on the material surface; speed, PPI and power set so the line cuts through or engraves to enough depth

- Overlocker: four threads in place; chain of stitching formed; thread tension suits the fabric so stitches form without puckering or snapping; neat stitching; thread colour matches; test sample
- Vacuum former: former in the correct place; sheet the correct way round; seals working; pin holes in the former so air can escape; temperature correct so the sheet is soft and flexible
- 3D printer: bed level; nozzle clearance; nozzle temperature right for the filament (e.g. PLA); correct software and bed dimensions; test print
- Lathe: work secure and central in the chuck; tool tip in line with the centre; correct speed to avoid heat and vibration that spoil the finish

Q8.

One mark for each:

- Marking out the window (1)
- Sawing to shape, leaving a small amount of waste to remove (1)
- An appropriate saw named, e.g. band saw, Hegner (scroll) saw, coping saw or tenon saw (1). Do not accept jigsaw
- Edges made flat and smooth with files, a disc sander or wet and dry paper (1). Do not accept glasspaper or sandpaper
- Any valid safety precaution for a correct process (1)

Q9.

One mark for each precaution (hand or machine/power tools). It must say the precaution, e.g. “wear goggles to protect the eyes”, not just “goggles”. For example:

Preparation

- Select the correct tool so the task can be done safely
- Wear the correct PPE, e.g. goggles, dust mask, safety footwear; tie hair back
- Check power tools have been PAT tested and the flex is not damaged
- Know how to isolate the equipment and where the emergency stop buttons are
- Be fully trained in the safe use of the tool; carry cutting tools point down

Cutting

- Use hand cutting tools pointing away from yourself

- Make sure dust extraction is on with power tools, and select the correct speed
- Hold the work securely, e.g. in a vice; make sure guards are in place and used
- Keep fingers and hands behind the cutting edge; concentrate and avoid distractions

After use

- Return tools to safe storage, cover or retract blades
- Turn off and isolate powered cutting tools

Q10.

One mark for each clear precaution. Do not award marks for just naming equipment or clothing, e.g. “goggles” on its own: the answer must say how it protects. For example:

- Wear goggles when welding to protect the eyes from bright light
- Wear goggles to stop hot splashes, e.g. hot wax, getting into the eyes
- Wear heat proof gloves to protect hands from burns, e.g. when casting or handling hot plastic
- Do not touch the heated part of the tool, e.g. soldering iron tip, heating elements
- Do not point a heat source at another person, e.g. a brazing torch
- Return equipment to a safe place until it cools, e.g. a soldering iron stand; position hot equipment safely
- Have a fire extinguisher nearby; do not work alone
- Have correct training; work in a well-ventilated room
- Make sure extraction is on when heating materials that give off fumes, e.g. casting, wax

Q11. (8 marks)

Mark in clusters:

- Hazard identified (1)
- Action appropriate to that hazard (1)
- Promotion of safe use appropriate to that hazard and action (1)

Maximum of 2 hazards, 2 actions and 2 promotions (6 marks), plus 2 marks for a full, well-structured explanation (1 mark for a brief or vague one). A simple list of safety issues with examples is limited to 4 marks.

Only award hazards, not equipment or materials. Do not reward repetition, e.g. goggles for different hazards. Hazards must be ones found in a design and technology workshop, not in commercial manufacture.

Equipment that may be discussed:

- Resistant materials: jigsaw, hot glue gun, sander, laser cutter, pillar drill, lathe
- Textiles: wax pot, sewing machine, iron, needles, dyes
- Electronics: UV light box, soldering iron, vacuum former, gerbil cutter
- Graphics: craft knives, vinyl cutter, guillotine, die cutters

Q12.

One mark for each relevant precaution against an identified hazard (fumes, poisonous chemicals, dust irritation or UV light). No marks for generic PPE. For example:

- Use fume extraction against fumes from soldering, etching and tinning
- Handle the chemicals used in the photo etch process safely, e.g. developing solution, ferric chloride, tinning salts
- Avoid exposure to the UV light used in the photoresist process