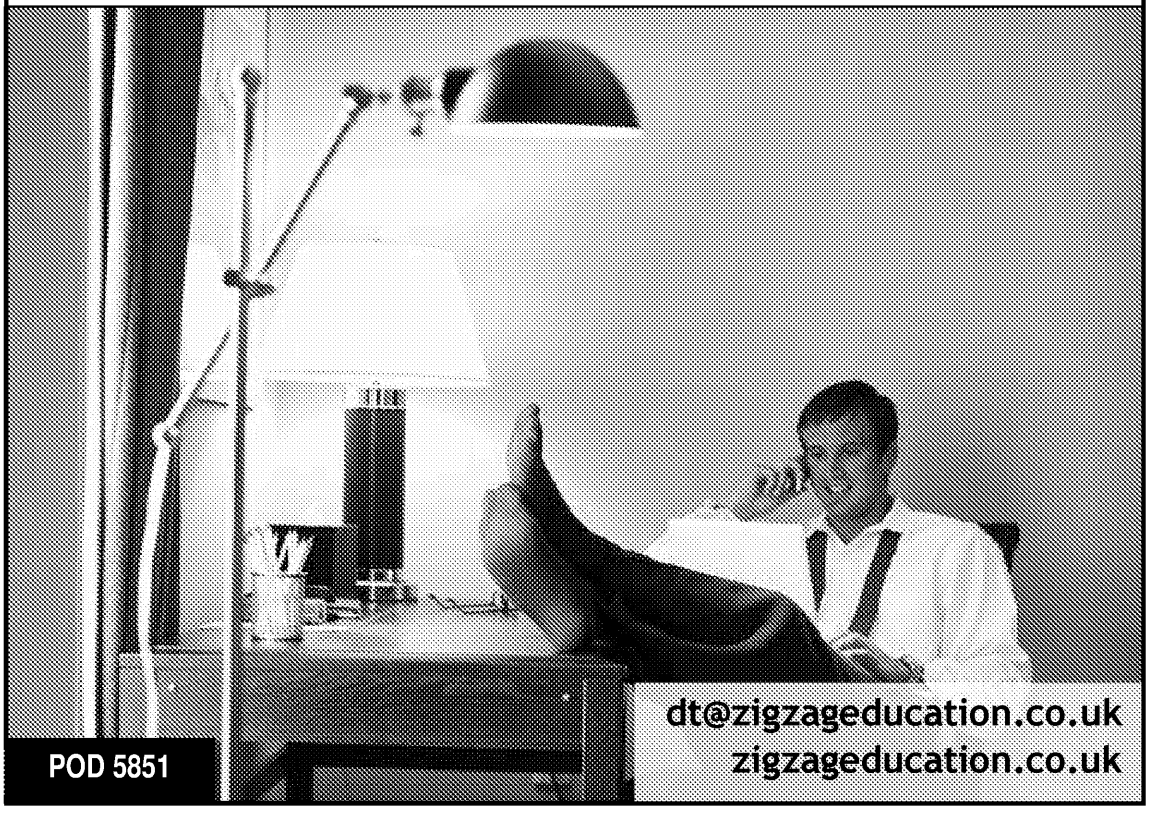
AQA Resistant Materials Practice Papers 2015

Pre-release context for Section A:
'Task Lighting'



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Contents

Teacher's Introduction

In the run-up to the summer examinations the importance of preparing for the examination becomes greater. With this in mind, the pack contains two examination papers, with Section A based on the summer 2015 pre-release design context (Task Lighting).

Each paper follows the structure of a typical AQA examination paper, and as such can be used as either mock examinations using the full paper, or as revision materials by considering each question individually.

Alongside each paper there is a mark scheme which has indicative answers for each question. Combining these together can provide students with an invaluable insight into what is required of them when they sit the examination during the summer.

This resource is intended to supplement your teaching only.

As with all pre-release material it is the teacher's responsibility to decide in what way to assist their students, and to decide how this resource in particular can be used to fit into that assistance.

The resources here are provided as an interpretation of the preliminary material.
The author does not have any special knowledge of what to expect on any particular exam.

Name	

ZigZag Education supporting
AQA GCSE Design Technology
Resistant Materials – Unit 1 [45601]

Practice Paper 1
Pre-release Context: Task Setting

Time: 2 hr

Instructions

- Use black ink or black ballpoint pen. Use pencil and coloured pencils only for drawing.
- Fill in the box at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box, around each page or on blank pages.
- Do all rough work in this answer book. Cross through any work you do not want to be marked.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 120.
- The question in Section A relates to the pre-release context.
- You are reminded of the need for good English and clear presentation in your answers.
- Quality of written communication will be assessed in Question 7.

Section A

Answer **all** questions in the spaces provided

In this section you will be asked to:

- produce a Design Specification
- create a range of ideas
- develop one of these ideas
- evaluate your chosen idea

Design Brief

A local company wants to design a new and creative desk lamp. The lamp provide light for one person to be able to read or write.

They have asked you to design the lamp. The target market for the product

Question 1 is about design criteria.
You should spend about 6 minutes on this question.

Give three design requirements for the desk lamp. Explain each of your ar

An example has been completed for you.

Requirement: The lamp should have no sharp edges.
Explanation: This will mean that the user will not be cut when moving it.

1 a) Requirement .....

.....

Explanation .....

.....

b) Requirement .....

.....

Explanation .....

.....

c) Requirement .....

.....

Explanation .....

.....

Question 2 is about creative design.
You should spend about 15 minutes on this question.

2 Study the information given in the Design Brief and your Design Spec
Use this information to help you sketch five different ideas for the des

Marks will be awarded for creativity.

Question 3 is about developing a design idea.
You should spend about 10 minutes on this question.

3 Choose your best idea from Question 2.
Use notes and sketches to show how you would develop your design.

Marks will be awarded for:

- details of materials and finishes *(3 marks)*
- method of construction *(3 marks)*
- design features and sizes *(3 marks)*

Question 4 is about evaluation.
You should spend about 3 minutes on this question.

4 Evaluate your developed design.

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Section B

Answer **all** questions

Question 5 is about materials.
You should spend about 18 minutes on this question.

5 a) Explain the difference between a thermoplastic and a thermosetting

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b) Complete the table below.

Name two examples of thermoplastics and one example of a therm

For each material, state one example of a product that has been m

Type of Plastic	Example of material	A
Thermoplastic		
Thermoplastic		
Thermosetting		

c) Explain what is meant by a composite material.

.....

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.....

.....

d) Name two composite materials.

State an application for which each material is used and explain why it is a good choice for this application.

Material .....

Application .....

Explanation .....

.....

.....

.....

Material .....

Application .....

Explanation .....

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Question 6 is about planning for manufacture.
You should spend about 15 minutes on this question.

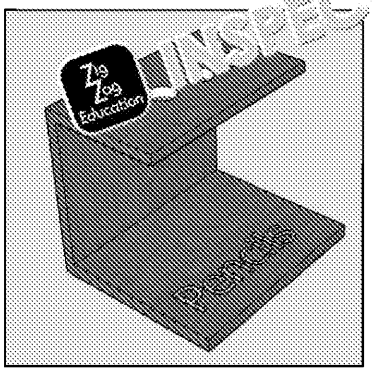
6 A design for a pencil holder is shown below. This design could be mad
wood, metal or plastic.

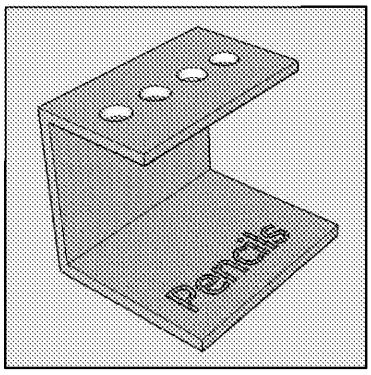
Choose one of the materials to make the pencil holder and tick the ap

Wood ☐

Metal ☐

Pl... ☐





Use notes and sketches to show how you would make a batch of ten pr
material in a school workshop.

At each stage, name all the tools, equipment or software you would use

Stage 1: Marking out or CAD (Computer-Aided Design)

Stage 2: Cutting and shaping or CAM (Computer-Aided Manufacture)

Stage [illegible] joining or joining

Stage 4: Applying the surface finish

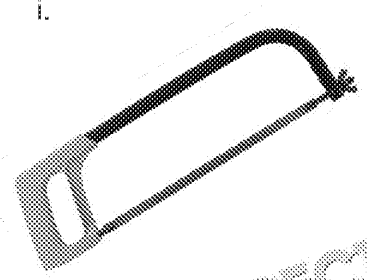
Stage 5: Producing the [illegible]

Question 7 is about tools and health and safety.
You should spend about 14 minutes on this question.

7 a) Name each of the following tools.

For each tool, identify a specific process where you would use it.

i. Name .....



Process .....

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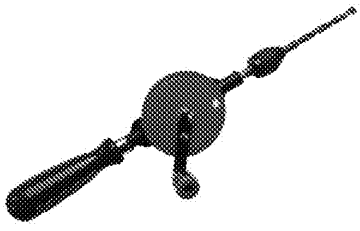
ii. Name .....



Process .....

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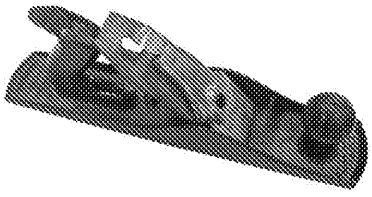
iii. Name .....



Process .....

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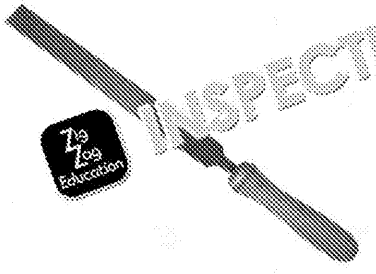
.....

iv. Name .....



Process .....

.....

.....

b) A student is about to use a lathe to turn a piece of metal.

List three safety precautions that they should take. For each, expl

Precaution 1 .....

Explanation.....

.....

Precaution 2 .....

Explanation.....

.....

Precaution 3 .....

Explanation .....

.....

Question 8 is about social, cultural, economic and environmental issues.
You should spend about 15 minutes on this question.

8 a) Choose three words from the list below:

Rethink **Reduce** **Refuse** **Repair** **Reus**

Explain what your chosen words mean when designing and using

i. Word selected: .....

Meaning.....

.....

.....

.....

ii. Word selected: .....

Meaning.....

.....

.....

.....

iii. Word selected: .....

Meaning.....

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Question 8 continues on the next page

a) A company is planning to manufacture an electric fan.

Describe five different things that will contribute to the total cost that

1 .....

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2 .....

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3 .....

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4 .....

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5 .....

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b) Explain how the designing and making of a product can be influen
society.

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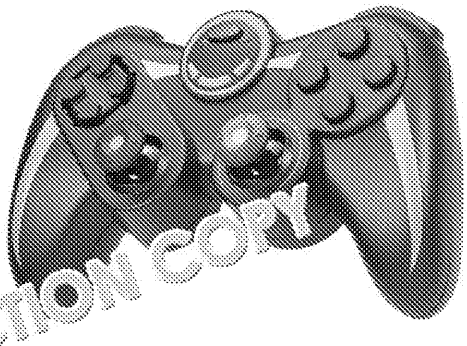
Question 9 is about research.
You should spend about 6 minutes on this question.

9 A designer is developing a new design for the controller for a video ga



The d[illegible]r needs to investigate the features and properties required
three d[illegible]ent sources of research information that the designer may u

For each source of information, explain why it is necessary to carry ou

Research 1 .....

Explanation.....

.....

Research 2 .....

Explanation.....

.....

Research 3 .....

Explanation.....

.....

Question 10 is about quality of manufacturing.
You should spend about 8 minutes on this question.

10 a) State four methods or approaches that aid accuracy and repetition

1 .....

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2 .....

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3 .....

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4 .....

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b) Explain why 'tolerance' is important during the manufacturing of c

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Question 11 is about the design process.
You should spend about 10 minutes on this question.

11 A design team is designing a product that will be made in large quanti
Discuss how they should evaluate their design ideas.

Your quality of written communication will be assessed in this question

Name	

ZigZag Education supporting
AQA GCSE Design Technology
Resistant Materials – Unit 1 [45601]

Practice Paper 2
Pre-release Context: Task [illegible]ing

Time: 2 h[illegible]

Instructions

- Use black ink or black ballpoint pen. Use pencil and coloured pencils only for drawing.
- Fill in the box at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box, around each page or on blank pages.
- Do all rough work in this answer book. Cross through any work you do not want to be marked.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 120.
- The question in Section A relates to the pre-release context.
- You are reminded of the need for good English and clear presentation in your answers.

Section A

Answer **all** questions in the spaces provided

In this section you will be asked to:

- produce a Design Specification
- create a range of ideas
- develop one of these ideas
- evaluate your chosen idea

Design Brief

A local company wants to design a new and creative reading light. The light is able to read books while sitting in bed.

The company has asked you to design the light. It has said that it must be for the target market for the product will be old people.

Question 1 is about design criteria.
You should spend about 6 minutes on this question.

Give three design requirements for the reading light. Explain each of your

An example has been completed for you.

Requirement: The light should be powered by batteries.
Explanation: This will mean that it will be easy to move as it does not need

1 a) Requirement .....

.....

Explanation .....

.....

b) Requirement .....

.....

Explanation .....

.....

c) Requirement .....

.....

Explanation .....

.....

Question 2 is about creative design.
You should spend about 15 minutes on this question.

2 Study the information given in the Design Brief and your Design Spec
Use this information to help you sketch five different ideas for the read

Marks will be awarded for creativity.

Question 3 is about developing a design idea.
You should spend about 10 minutes on this question.

3 Choose your best idea from Question 2.
Use notes and sketches to show how you would develop your design.

Marks will be awarded for:

- details of materials and finishes *(3 marks)*
- method of construction *(3 marks)*
- design features and sizes *(3 marks)*

Question 4 is about evaluation.
You should spend about 3 minutes on this question.

4 Evaluate your developed design against the design specification that you wrote for Question 1.

Section B

Answer **all** questions

Question 5 is about materials.
You should spend about 18 minutes on this question.

5 a) i. Name one non-ferrous metal.

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ii. Describe the process involved in converting the material yo
its sc[illegible] a workable material.

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iii. Describe two forms in which ferrous and non-ferrous metals a

1 .....

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2 .....

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b) i. Explain what is meant by the term 'smart material'.

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ii. Name two specific 'smart materials'.
Describe the properties of each material. Explain how each c

Material 1 .....

How it can be used .....

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Material 2 .....

How it can be used .....

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Question 5 is continued on the next page

c) Adhesives can be used to form a permanent joint between materi

Draw straight lines to link each of the following adhesives with the most suitable for.

Epoxy resin	To reinforce a two piec
Polyvinyl acetate (PVA)	To attach a m
Liquid solvent cement (tensol)	To join a bar sheet of th

Question 6 is about planning for manufacture.
You should spend about 15 minutes on this question.

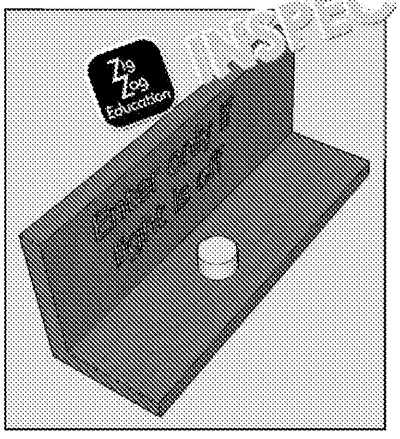
6 A design for a sign is shown below. It includes a circuit with a LED. Wh
that the person should wait before entering a room. This design could
workshop using wood, metal or plastic.

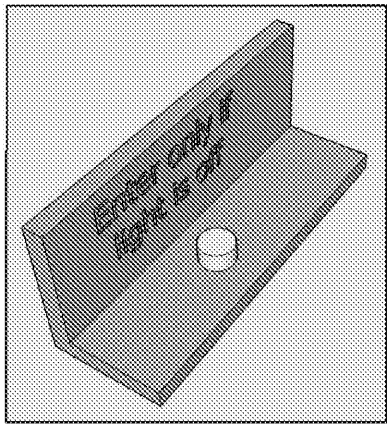
Choose one of the materials to make the sign and tick the appropriate

Wood ☐

Metal ☐

Plastic ☐





Use notes and sketches to show how you would make a batch of twenty
material in a school workshop.

At each stage, name all the tools, equipment or software you would use

Stage 1: Marking out or CAD (Computer-Aided Design)

Stage 2: Cutting and shaping or CAM (Computer-Aided Manufacture)

Stage 3: Bending or joining

Stage 4: Soldering the circuit

Stage 5: Producing the template

Question 7 is about manufacturing processes.
You should spend about 14 minutes on this question.

7 a) i. Name a process that can be used to bend a piece of wood.

.....

ii. Describe how the process named in i) is used.

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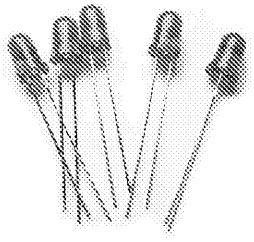
b) Using notes and sketches, in the box below describe the process o

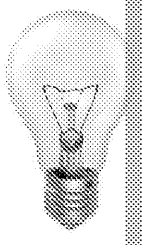
c) Using notes and sketches, in the space below describe how stereo
make a rapid prototype of a product.

Question 8 is about electrical components and national standards.
You should spend about 13 minutes on this question.

Many modern task lights use LEDs instead of filament bulbs.



LED



Bulb

a) i. State what LED stands for.

.....

ii. Describe the function of an LED.

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iii. Compare the use of an LED in a torch to the use of a filament

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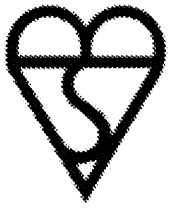
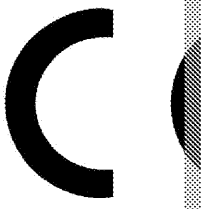
Question 8 continues on the next page

b) i. Explain the meaning of the following symbols:





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ii. What is the purpose of national standards?

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Question 9 is about ergonomics.
You should spend about 7 minutes on this question.

9 a) What is meant by anthropometric data?

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b) When designing [illegible] anthropometric data, why is the range from [illegible] percentile important?

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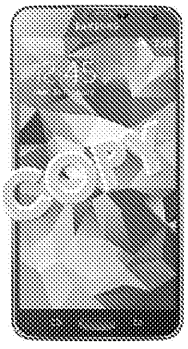
c) Identify one feature of a mobile smartphone where the designer o[illegible] used anthropometric data to ensure that it is fit for purpose.

Describe the specific type of data that would have been used.



Feature .....

Type of data used .....

.....

.....

Question 10 is about modelling design ideas.
You should spend about 9 minutes on this question.

10 a) Give three reasons for making models of design ideas.

1 .....

.....

2 .....

.....

3 .....

.....

b) Name four suitable materials for making scale models.

1 .....

2 .....

3 .....

4 .....

c) Give two examples of product characteristics that **cannot** be evalu
using common modelling materials.

1 .....

.....

2 .....

.....

Question 11 is about the use of Computer-Aided Manufacturing.
You should spend about 10 minutes on this question.

11 CAM is widely used in the development of products. Describe and exp
disadvantages of using CAM to produce products.

Your quality of written communication will be assessed in this question

Practice Paper 1 Mark Scheme

Section A

1 Any sensible design criteria appropriate to the chosen target user, sup
appropriate reason; for example: dimensions, aesthetics, ergonomics,
Give credit for the reason where appropriate even if the design criterio
versa.

Award 1 mark for each appropriate design criteria identified, up to a m
Award 1 mark for each appropriate reason, up to a maximum of 3 mar
Do not award a mark for a reason that is inappropriate to the user, not
requirements in the brief or repeats the example given.

Acceptable requirements include:

1. Should have all the electric[illegible]lly enclosed or be made from ma
insulator
2. Must be so[illegible]d constructed
3. Should be capable of being manufactured in quantity
4. Must be ergonomically designed
5. Must be durable
6. Should be relatively inexpensive
7. Should be made from sustainable materials

Acceptable explanations include:

1. To reduce the risk of electrocution
2. It should not break when in use
3. Making things in bulk reduces the unit cost
4. It should be easy and comfortable to use
5. It should withstand everyday use
6. The target market must be able to afford it
7. To be environmentally friendly / minimise negative impact on the

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2 Award up to 3 marks each for up to five ideas, as follows:

- 0 marks for a repeat idea
- 1 mark for a simple, obvious idea lacking in detail (e.g. simple g
- 2 marks for a simple idea displaying some creativity (e.g. usual
feature, different method of adjustment)
- 3 marks for a creative idea (e.g. irregular shape with several un
alternative methods of adjustment and mounting)

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3 Materials and finish – award up to 3 marks as follows:

- 1 mark each for details relating to two materials or 2 marks for a
justification
- 1 mark each for details relating to two types of finish or 2 marks
a justification

Construction:

- Award 1 mark for a simple reference to a method of construction
- Award 2 marks for an outline of a method of construction.
- Award 3 marks for detailed information relating to a method of c

Design features – award up to a maximum of 3 marks as follows
1 mark each for details relating to two design features
1 mark each for two relevant sizes

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4 Comments must be justified to be awarded marks.

- Award 0 marks for a response that simply states features of the
- Award 1 mark for a response that makes a judgment or opinion ab
- Award 2 marks for a response that gives judgments or opinions ab
features.
- Award 3 marks for a response that gives judgments or opinions ab
features.

Section B

5 a Award 1 mark for stating that thermoplastics can change their shape
a second mark for stating that thermosets cannot change their shape

b Award 1 mark for naming each suitable specific material up to a max
e.g. polypropylene, HIPS, acrylic, melamine formaldehyde, etc.
Award 1 mark for identifying one appropriate product made with eac
materials up to a maximum of 3 marks, e.g. drinks bottles, blister pac
lenses for spectacles, kitchen worktops, etc.

c Award 1 mark for a statement that defines a composite as a mixture
materials; award a second mark if it is stated tha the materials rema
within the structure.

d For each of the two materials, award up to 4 marks as follows:

- Award 1 mark for naming a composite material, such as CRP, G
concrete.
- Award 1 mark for identifying an appropriate application, e.g. cra
shells, construction of buildings, etc. respectively.
- Award 1 mark for a statement that refers to a property of the co
resistance, lightweight, compressive strength. Award a second m
explained in terms of the requirements of the application or by c
material that could be used for the application. For example, (CF
body shells of high performance vehicles because) it has a bett
ratio than steel body panels.

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6 In the following scheme, where there is a choice (e.g. traditional or C
separate mark schemes are listed following each other. In each cate
listed for only one approach – i.e. either traditional or CAD marking c

Stage 1: Marking out (traditional)

- Award 1–2 marks if there is sufficient detail for most of the desig
as a one-off by a third party, with some tools and equipment giv
- Award 3–4 marks if there is sufficient detail for most of the desig
by a third party, in quantity, using a template and most tools and

Or Stage 1: Marking out CAD

- Award 1–2 marks if there is sufficient detail for the design to be
using CAD, and some tools and equipment are given.
- Award 3–4 marks if the requirements for 1–2 marks have been
additional detail relating to more than two of: computer hardware
on-screen nets, the use of coloured lines and power settings.

Stage 2: Cutting and shaping (traditional)

- Award 1–2 marks if there is sufficient detail for some of the desi
shaped as a one-off by a third party, with some tools and equipm
- Award 3–4 marks if there is sufficient detail for most of the desig
shaped by a third party in quantity, using power tools and jigs, w
equipment given.

Or Stage 2: Cutting and shaping CAM

- Award 1–2 marks if there is sufficient detail for the design to be
CAM with some tools and equipment given.
- Award 3–4 marks if the requirements for 1–2 marks have been
additional detail relating to more than two of: safety, tessellation
data to CAM machines such as a laser cutter or CNC router, po
material selection, clamping the work piece and changing tools.

Stage 3: Bending/joining

- Award 1–2 marks if there is sufficient detail for some of the desi
joined by a third party, with some tools and equipment given.

- Award 3–4 marks if there is sufficient detail for most of the desig joined, in quantity, by a third party with use of jigs or formers, wi equipment given.

Or Stage 3: Bending/joining CAM

- Detail given in stage 2 on the use of a laser cutter or CNC route data to CAM equipment can be given credit here.
- Award 1–2 marks for a description of how to cut the joints, and on the bending or joining processes, if there is sufficient informa processes to be carried out by a third party.

Stage 4: Applying the surface finish (traditional)

- Award 1–2 marks if there is sufficient de[illegible]r the design to be party with most tools and equipm[illegible]. Detail could include material preparation, use [illegible] aerosol / rag / abrasive pa varnish/paint/polish

Or Stage 4: Applying the surface finish (CAM)

- Award 1–2 marks if there is reference to the fact that a laser-cut ot need finishing (1) as the laser produces a good quality finish
- Alternatively, award 1–2 marks for reference to improving the qu by the use of wet and dry paper, and polishing/buffing.

Stage 5: Producing the text (traditional)

- Award 1–2 marks if there is sufficient detail for the logo to be appl with most tools and equipment given. Detail could include th stencils/templates, or the application of varnish/paint

Or Stage 5: Producing the text (CAD/CAM)

- Relevant detail given in Stages 1 and 2 can be given credit here
- Award 1–2 marks for reference to the fact that the logo would be laser. Detail could include the following: the logo being produce software package, etching by the laser cutter, or the logo being cutter.

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7 a Award 1 mark for correctly identifying each tool and 1 mark for statin situation in which it is used, e.g. the type of material that the tool is u The mark can be awarded for the process even if the tool is incorrec names and an example of the processes are shown below.

i Hacksaw: e.g. cutting metal

ii Eggbeater drill: e.g. making holes in wood

iii Plane: e.g. smoothing or shaping the surface of a piece of wood

iv Square edge file: e.g. shaping [illegible] metal, removing the rough mild steel

b Award 1 [illegible] for each appropriate precaution, up to a maximum of 3 [illegible] ac[illegible]ect explanation, up to a maximum of 3 marks. Respons [illegible]ie hair back / tuck ties away – to prevent entanglement in the n

- Use the machine guard – to prevent entanglement, provide prot bris
- Wear safety glasses / goggles – to provide protection against de
- Clamp the work piece – to avoid risk of it being thrown, causing

8 a Award 1 mark each for a simple or limited statement. Award 2 marks explanation that relates to the design or use of a product.

Examples of meanings:

- Rethink – reviewing the function or functions of the product and needed
- Reduce – redesigning the product so that less material or energ manufacture and use
- Refuse – not using a product, material or process if it is not the environment
- Repair – extending the life of the product, by designing it to allow maintenance
- Reuse – redesigning the product so that its parts or components products without modification
- Recycle – ensuring that the materials used make the product and used to make other product

b Award 1 mark each, [illegible] maximum of 5 marks, for answers such

- Cost of design
- Labour time / wages to manufacture parts
- Labour time / wages to assemble parts
- Materials/plastic
- Electronic components
- Machinery, tools and equipment
- Packaging
- Transportation
- Profit.

c Award 1 mark for each of the following points, or 2 marks if the point points including the following, up to a maximum of 4 marks:

- Explanation of what is meant by culture (e.g. shared beliefs or v group or society)
- Differences in the interpretation of colour
- Culturally influenced patterns and surface decoration
- Importance of local fashions or trends
- Preference for products that are either handmade or made using
- Prohibition of the use of under-age labour
- Influence of locally sourced materials

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9 Award 1 mark for each relevant type of research, up to a maximum o mark for each correct explanation, up to a maximum of 3 marks.

Possible responses include:

- Carry out a questionnaire / interviews with target market – to ga the target market
- Use books / the Internet – to gain information
- Product analysis – to identify how existing products are made, w are made from and identify their key features
- Anthropometric research – e.g. to identify the size of the grip for
- Market research – to find what designs are already being sold
- Materials testing – to ensure that the materials will be strong en design
- Research [illegible] methods – to ensure that the materials w

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10 a Award 1 mark for each of the following up to a maximum of 4 marks:

- Use of jigs and fixtures
- Use of templates
- Use of Go-No Go gauges
- Use of CNC machines / CAM
- Monitoring materials when they are supplied to ensure they are
- Quality assurance systems
- Training / skilled staff

b Award 1 mark each for the following up to a maximum of 4 marks:

- Tolerance is the acceptable variation in dimensions between co
  maximum and minimum sizes that a component can be
- It is very difficult to make a component precisely correct
- It is easier to make a component within tolerances; this can also
- The tolerance specifies the maximum and minimum sizes a com
- A manufacturer knows that if a product is within tolerances then

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11 6 marks to be awarded for the answer and 4 marks for quality of writ
(QWC).

Award 1 mark for referring to each of the following points, or 2 marks
explanation of the relevance of the point, up to a maximum of 6 mark

- Methods of testing the ideas, including modelling
- Checking ideas against the original specification
- Modifying the specification after considering the design ideas
- Reducing the number of parts to simplify construction
- The use of standard parts or sub-assemblies to simplify construc
- Considering the views of the client, manufacturer and user, e.g.

Other suitable comments should also gain credit.

Award marks as follows for the quality of written communication:

- 4 marks – no obvious errors in spelling or grammar; good logica
- 3 marks – few errors in spelling or grammar
- 2 marks – some errors in spelling and grammar
- 1 mark – several spelling and grammar errors

Practice Paper 2 Mark Scheme

Section A

1 Any sensible design criteria appropriate to the chosen target user, sup
appropriate reason. For example, dimensions, aesthetics, ergonomics,
dimensions, etc. Give credit for the reason where appropriate even if th
incorrect and vice versa.

Award 1 mark for each appropriate design criterion identified, up to a m
Award 1 mark for each appropriate reason, up to a maximum of three m
Do not award a mark for a reason that is inappropriate to the user, not
requirements in the brief or repeats the example given.

Acceptable requirements include:
1. Should have all the electrics fully e[illegible] or be made from mate
insulator
2. Must be soundly c[illegible]
3. Should be c[illegible] of being manufactured in quantity
4. Must be [illegible]omically designed
[illegible]st be durable
[illegible]ould be relatively inexpensive
[illegible]hould be made from sustainable materials / use rechargeable ba

Acceptable explanations include:
1. To reduce the risk of electrocution
2. It should not break when in use
3. Making things in bulk reduces the unit cost
4. It should be easy and comfortable to use
5. It should withstand everyday use
6. The target market must be able to afford it
7. To be environmentally friendly / minimise negative impact on the

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2 Award up to 3 marks each for up to five ideas, as follows:
- 0 marks for a repeat idea
- 1 mark for a simple, obvious idea lacking in detail (e.g. simple geo
- 2 marks for a simple idea displaying some creativity (e.g. usual sh
feature, different method of adjustment)
- 3 marks for a creative idea (e.g. irregular shape with several unus
alternative methods of adjustment and mounting)

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3 Materials and finish – award up to 3 marks as follows:
- 1 mark each for details relating to two materials or 2 marks for a s
justification
- 1 mark each for details relating to two types of finish or 2 marks fo
a justification

Construction:
- Award 1 mark for a simple reference to a [illegible]od of construction.
- Award 2 marks for an outline of a [illegible] construction.
- Award 3 marks for detailed [illegible] relating to a method of con

Design features/si[illegible] up to a maximum of 3 marks as follows
- 1 mar[illegible] details relating to two design features
[illegible] for two relevant sizes

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4 Comments must be justified to be awarded marks.
- Award 0 marks for a response that simply states features of the de
- Award 1 mark for a response that makes a judgment or opinion ab
feature.
- Award 2 marks for a response that gives judgments or opinions ab
features.
- Award 3 marks for a response that gives judgments or opinions ab
features.

Section B

5 a i Award 1 mark for a suitable named metal that does not contain iron, e copper.

ii Award marks as follows, where the candidate describes an appropriat conversion for the stated material.
- Award 1 mark for a limited or simplistic statement which mentions
- Award 2 marks for a sound response showing a basic understand process.
- Award 3 marks for a concise, detailed response showing a good u conversion process.

For example, aluminium is mined from the gro s bauxite. This ore temperatures to extract the aluminium. Th d aluminium can be ca slabs, which can be rolled out to ke sh ets. (3 marks)

iii Award 1 mark for a appropriate form identified (e.g. sheet, rod, bar mark for ea ia tion of the form (e.g. size ranges, etc.) ui marks.

b i A d 1 mark for a simplistic statement that says the material has a p or similar. Award 2 marks if this is qualified in terms of responding to a environment.

ii Award up to 6 marks in total, as follows:
- Award 1 mark each for naming two specific smart materials such a tunnelling compound (QTC), thermochromic pigment, photochrom memory alloy (nitinol). Maximum of 2 marks.
- Award 1 mark each for describing the relevant properties of each example: QTC changes its electrical conductivity under pressure; photochromic pigments change colour in response to temperature respectively; shape memory alloy returns to its original shape whe of 2 marks.
- Award 1 mark each for explaining how each material could be use giving a suitable example of a product that uses it. For example: Q pressure switches or keypads; thermochromic pigments can be us thermometers or to indicate the temperature of the contents in foo photochromic pigments can be used in colour-change sunglasses alloy is used as muscle wire in robotic arms or to activate fire alar sprinklers. Maximum of 2 marks.

c Award 1 mark for each correct linkage:
- Epoxy resin – to attach a metal plate to a piece of wood
- PVA – to reinforce a dowel joint between two pieces of softwood
- Liquid solvent cement – to join a bar of thermoplastic to a sheet of

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6 In the following scheme, where there is a choi (e.g. traditional or CA separate mark schemes are listed follo wi each other. In each categ listed for only one approach - the traditional or CAD marking ou

Stage 1: Markin ditional)
- Award 1–2 arks if there is sufficient detail for most of the design ne n by a third party, with some tools and equipment given.
- ard 3–4 marks if there is sufficient detail for most of the design a third party, in quantity, using a template, and most tools and equ

Or Stage 1: Marking out CAD
- Award 1–2 marks if there is sufficient detail for the design to be dr using CAD, and some tools and equipment are given.
- Award 3–4 marks if the requirements for 1–2 marks have been me additional detail relating to more than two of computer hardware, s screen nets, the use of coloured lines and power settings.

Stage 2: Cutting and shaping (traditional)

- Award 1–2 marks if there is sufficient detail for some of the design shaped as a one-off by a third party, with some tools and equipme
- Award 3–4 marks if there is sufficient detail for most of the design shaped by a third party, in quantity, using power tools and jigs, wit equipment given.

Or Stage 2: Cutting and shaping CAM

- Award 1–2 marks if there is sufficient detail for the design to be m with some tools and equipment given.
- Award 3–4 marks if the requirements for 1–2 marks have been me additional detail relating to more than two of: safety, tessellation o data to CAM machine such as a laser cutter or CNC router, power selection, clamping the work piece and cutting tools.

Stage 3: Bending/joining

- Award 1–2 marks if there is sufficient detail for some of the design joined by a third party, with some tools and equipment given.
- Award 3–4 marks if there is sufficient detail for most of the design bent, in quantity, by a third party with use of jigs or formers, with equipment given.

Or Stage 3: Bending/joining CAM

- Detail given in stage 2 on the use of a laser cutter or CNC router a data to CAM equipment can be given credit here.
- Award 1–2 marks for a description of how to cut the joints, and 1–2 the bending or joining processes, if there is sufficient information t processes to be carried out by a third party.

Stage 4: Soldering the circuit

Award 1 mark for each of the following points, up to 2 marks.

- Use of a soldering iron
- Use of solder
- Stripping the wire
- Tinning the wire or components
- Using heat to melt the solder
- Allowing the solder to cool to form the joint

Stage 5: Producing the text (traditional)

- Award 1–2 marks if there is sufficient detail for the logo to be appli with most tools and equipment given. Detail could include the stencils/templates, or the application of varnish/paint.

Or Stage 5: Producing the text (CAD/CAM)

- Relevant detail given in Stages 1 and 2 can be given credit here.
- Award 1–2 marks for reference to the fact that the logo would be e laser. Detail could include the following: the logo being produced o software package, etching by the laser cutter, or the logo being pr cutter.

7 a i Award 1 mark for either kerfing, steam bending or laminating.

ii Award up to three marks as follows:

- Kerfing: use a saw (1) to cut evenly spaced slots (1) on the inside
- Steam bending: place the wood in a chest full of steam (1). As the steam it becomes pliable. It can then be bent in a former (1). Once its new shape (1).
- Laminating: Thin strips of wood called veneers are glued together clamped in a shaped former (1). Once the glue is set the shape w

b Award 1 mark each, up to a maximum of 5 marks, for details including:
- An appropriate plastic is named, such as acrylic or high-impact po
- A plastic sheet is clamped between a heater and a mould.
- The mould must be tapered to give a draft angle.
- When the sheet is softened the mould is raised up.
- Air in the cavity is pumped out.
- Air pressure forces the plastic against the mould.
- After it has cooled, the plastic is removed from the mould.
- Excess plastic is cut away from the finished moulding.

c Award 1 mark for each of the following points, up to a maximum of 5 m may be presented in text or diagram form:
- A 3D CAD drawing is produced.
- Software is used to divide the drawing [illegible] in layers.
- The machine has a tank of liquid resin.
- It contains a platform on which the prototype is built.
- A laser traces out the shape of one layer onto the resin.
- The platform is then lowered by the thickness of a layer and the ne
- The process is repeated until all the layers have been completed.

8 a i Award 1 mark for light-emitting diode.

ii Award 1 mark each for: it produces light; and it only allows electricity t direction.

iii Award 1 mark for each of the following points, to a maximum of 3 mark
- A filament bulb typically produces more light than an LED.
- An LED requires significantly less power than a filament bulb.
- LEDs are normally cheaper than filament bulbs.
- LEDs are typically more robust than filament bulbs (i.e. resistant to dropped).

b i Award up to 4 marks in total, as follows:
- Award 1 mark each for correctly identifying the two symbols (BSI K European symbol).
- Award 1 mark for stating that the products have been tested to a s they meet safety requirements. Award a second mark for additiona independent nature of testing or comparing what the different mark

For example: a product with the BSI Kitemark is independently tested is consistently of a high quality and safety standard (1).
The Conformité European symbol means that the product meets a min to be sold within the EU (1).
Typically the BSI Kitemark is a guarantee of higher quality standard th (1).

ii Award 1 mark each for up to three of the following points:
- They give the consumer confidence in the quality of the products
- They provide independent verification (or testing) of a product's pe
- They set safety standards, to protect the user
- Any other valid answer

9 a Award 1 mark for a brief statement, such as human measurements.
Award 2 marks for a detailed statement, such as a survey of human m designers create products suitable for human use. This may include re examples of, ergonomic design.

b Award 1 mark for a limited or simplistic statement, e.g. referring in gen
Award 2 marks for a sound description of the 5th to 95th percentile.
Award 3 marks for a detailed description of the 5th to 95th percentile, used by designers to ensure that products are ergonomic and comfort

c Award 1 mark for suitable feature (e.g. button size, width, distance bet
and speaker).
Award 1 mark for stating the relevant anthropometric data (e.g. finger
grip, distance from ear to mouth).

10 a Award 1 mark each, up to a maximum of 3 marks, for each of the follo
- To work out how individual parts fit together
- To check the size of the design
- To check that the design works
- To be able to show the model to the client

b Award 1 mark each for any appropriate material, up to a maximum of 4
thin card, corrugated card, paper, styrofoam, foamboard, balsa, wire, s
cleaners, polymorph, construction kits.

c Award 1 mark each, up to a maximum of 2 marks, for:
- Any named mechanical property
- Reducing manufacturing cost
- Aesthetic properties of the final product

11 6 marks to be awarded in answer to question and 4 marks for QWC.

Award 1 mark for describing each of the following points, up to a maxi

Advantages:
- Products made to a consistent/high quality
- Less chance of human error affecting product quality
- More efficient, accurate and/or faster production
- Not as many people may need to be employed, as machines repla
money)

Disadvantages:
- CAM equipment can be expensive to purchase
- Users have to spend time learning how to use the equipment; com
spend time/money training staff
- Less job availability for job seekers

Other suitable comments should also gain credit.

Award marks as follows for the quality of written communication:
- 4 marks – Excellent QWC with no obvious errors
- 3 marks – good coverage with very few grammatical errors
- 2 marks – coverage but with some obvious errors
- 1 mark – poor coverage and significant errors present