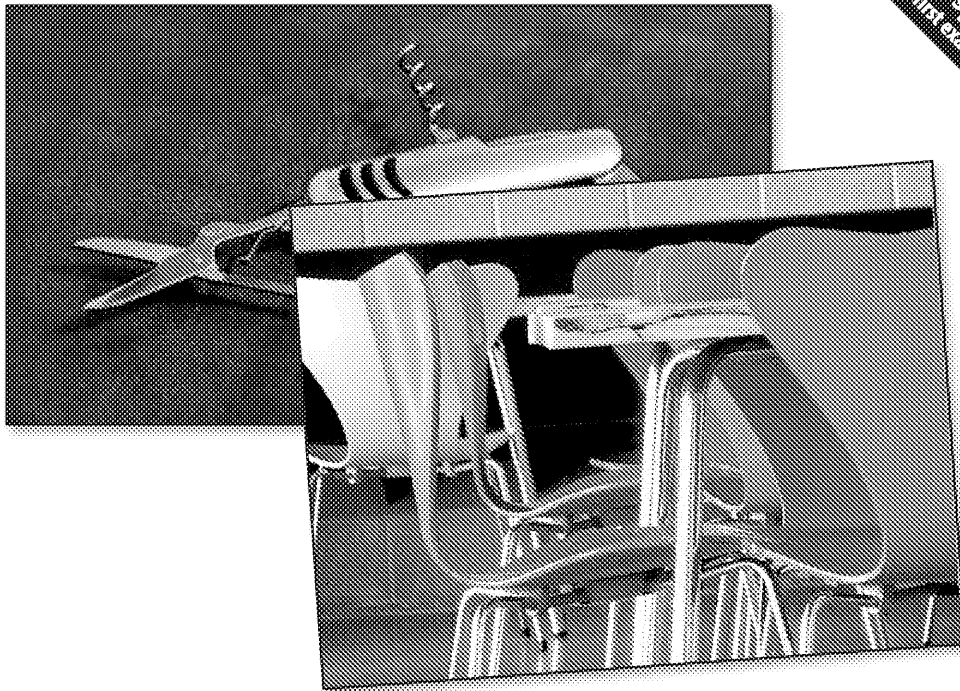


**2017 specification**  
first exams in 2019



# **Topic Tests for A Level**

## **AQA Product Design**

### 3.1 Technical Principles (Paper 1)

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# Contents

<b>Product Support from ZigZag Education .....</b>	<b>ii</b>
<b>Terms and Conditions of Use .....</b>	<b>iii</b>
<b>Teacher's Introduction.....</b>	<b>1</b>
<b>Write-on Topic Tests.....</b>	<b>2</b>
Topic Test 1: Materials and Their Applications.....	2
Topic Test 2: Performance Characteristics of Materials.....	7
Topic Test 3: Enhancement of Materials .....	12
Topic Test 4: Paper, Polymer and Metal Processes .....	17
Topic Test 5: Wood Processes, Adhesives and Jigs.....	23
Topic Test 6: The Use of Finishes.....	28
Topic Test 7: Modern Industrial and Commercial Practice .....	33
Topic Test 8: Digital Design and Manufacture .....	38
Topic Test 9: Design Requirements and Health and Safety.....	42
Topic Test 10: Intellectual Property.....	47
Topic Test 11: Manufacture, Maintenance, Repair, Disposal, Feasibility.....	51
Topic Test 12: Enterprise, Marketing, Design Communication .....	57
<b>Non-write-on Topic Tests.....</b>	<b>63</b>
Topic Test 1: Materials and Their Applications.....	63
Topic Test 2: Performance Characteristics of Materials.....	65
Topic Test 3: Enhancement of Materials .....	67
Topic Test 4: Paper, Polymer and Metal Processes .....	69
Topic Test 5: Wood Processes, Adhesives and Jigs.....	71
Topic Test 6: The Use of Finishes.....	73
Topic Test 7: Modern Industrial and Commercial Practice .....	75
Topic Test 8: Digital Design and Manufacture .....	77
Topic Test 9: Design Requirements and Health and Safety.....	78
Topic Test 10: Intellectual Property.....	80
Topic Test 11: Manufacture, Maintenance, Repair, Disposal, Feasibility.....	82
Topic Test 12: Enterprise, Marketing, Design Communication .....	84
<b>Mark Scheme.....</b>	<b>87</b>
Topic Test 1: Materials and Their Applications.....	87
Topic Test 2: Performance Characteristics of Materials.....	89
Topic Test 3: Enhancement of Materials .....	91
Topic Test 4: Paper, Polymer and Metal Processes .....	93
Topic Test 5: Wood Processes, Adhesives and Jigs.....	95
Topic Test 6: The Use of Finishes.....	97
Topic Test 7: Modern Industrial and Commercial Practice .....	99
Topic Test 8: Digital Design and Manufacture .....	101
Topic Test 9: Design Requirements and Health and Safety.....	103
Topic Test 10: Intellectual Property.....	105
Topic Test 11: Manufacture, Maintenance, Repair, Disposal, Feasibility.....	107
Topic Test 12: Enterprise, Marketing, Design Communication .....	109

## Teacher's Introduction

This resource consists of 12 topic tests covering AQA A Level Product Design: 3.1 Technical Principles (Paper 1). These topic tests are designed to test the students' knowledge and enable the teacher to identify the students' strengths and weaknesses in certain areas. Each test covers a range of question types, and there is a wide variety of stimulus material. The main aim of these tests is to cover the broad content of the specification. The tests have the additional benefit of testing student knowledge using exam-style questions and mark schemes, helping with exam preparation. Mark schemes for each topic test can be found at the back of this resource.

	Test	Specification Points	Marks
<i>3.1 Technical principles</i>	1	3.1.1 Materials and their applications	54
	2	3.1.2 Performance characteristics of materials	60
	3	3.1.3 Enhancement of materials	54
	4	3.1.4 Forming, redistribution and addition processes	59
	5	3.1.4 The use of finishes	58
	6	3.1.5 Modern industrial and commercial practice	60
	7	3.1.6 Digital design and manufacture	58
	8	3.1.7 The requirements for product design and development	60
	9	3.1.8–3.1.9 Health and safety	65
	10	3.1.10 Protecting designs and intellectual property	52
	11	3.1.11 Design for manufacturing, maintenance, repair and disposal	60
		3.1.12 Feasibility studies	
	12	3.1.13 Enterprise and marketing in the development of products	59
		3.1.14 Design communication	

**When to Use This Resource:** This resource can be used at the end of a particular topic area, or at the end of the whole unit in order to enable consolidation of knowledge. The students can also use the tests towards the end of the course, to assess knowledge either before or after revision.

**How to Use This Resource:** The tests can be completed individually in class, or set as homework tasks. The tests can be quickly marked by the student or the teacher, at home or in the classroom, as student-friendly answers are provided. These structured tests provide an opportunity to mark and score students in order to monitor progress. The tests are provided in a write-on format. Each test is worth between **52 and 65 marks** and takes about **50–65 minutes**.

**The Benefits to the Student:** Students can be confident they have been tested on every key aspect of the specification. After completing a test, they will know which areas they are strong in, and which require further work, and can set their own goals for future learning. The answer sections also provide students with an indication of what a good answer entails. In order to support lower-ability students while pushing the more able, each test has a range of different question styles from multiple-choice to longer-answer questions.

*November 2021*

## Topic Test 1: Materials and Their Applications

1. The ability to decide on a suitable material is an essential skill as a designer. Give **three** reasons why you think this is.

1. ....
2. ....
3. ....

2. Plastic is a non-metallic material. What physical property makes it this way?

- .....
- .....

3. i) Copper is used more than any other metals when it comes to electronic wiring. What properties makes it ideal for this application?

- .....
- .....

- ii) Describe how this property can be physically tested in a lab.

- .....
- .....
- .....

- iii) Suggest another suitable material for electronic wiring.

- .....
- .....

4. Metals can be grouped into three main classes. Name these **three** classes.

1. ....
2. ....
3. ....

5. Spruce is a softwood. Explain **two** properties of spruce.

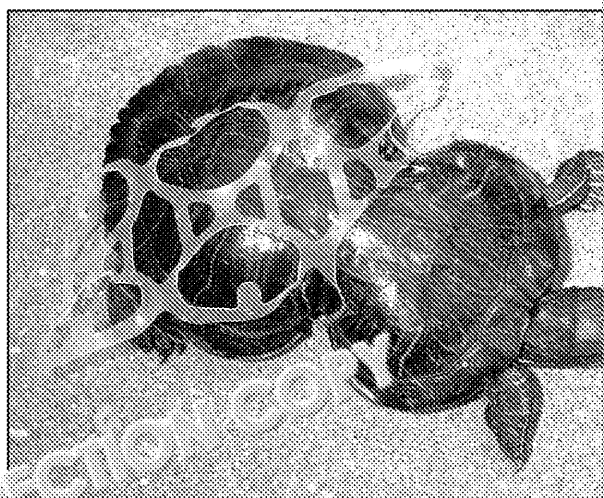
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6. Packaging is a rapidly developing industry in terms of material use. Consider



Debate whether this is a good material choice. Give **one positive** point and **one negative** point. Explain your answer. Take into consideration product disposal.

**Negative** .....

.....

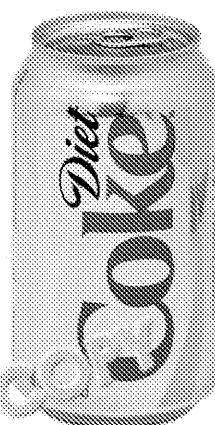
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**Positive** .....

.....

.....

7. Coca-Cola produces Diet Coke cans in vast quantities.



Give **three** reasons why aluminium is used.

1. ....

.....

.....

2. ....

.....

.....

3. ....

.....

.....

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8. Professional kitchens are required to meet certain standards. Stainless steel



- i) Which stock form would have been purchased to produce this kitchen in

.....

- ii) What size stock form would this material be bought in?

.....

- iii) Discuss the benefits of using stainless steel for this application.

.....

.....

.....

.....

.....

.....

- iv) Describe what mechanical properties make stainless steel suitable for this application.

.....

.....

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9. The following table is a list of both mechanical and physical properties. Tick property types.

Material property	Mechanical
Compressive strength	
Bending strength	
Torsional strength	
Plasticity	
Ductility	
Malleability	

10. Complete the following descriptions for the material property tests.

The tensile strength is tested by...

.....

.....

The Brinell test is...

.....

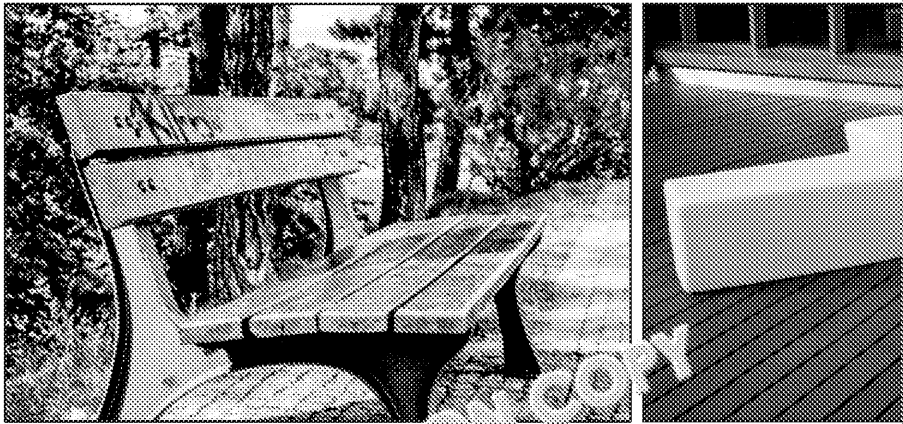
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11. Look at the images of the outdoor benches below.



Which do you think has the better material choice? Explain your reasoning, factors into your decision: aesthetics, manufacture, mechanical properties.

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12. Below is some raw data that was collected during some user interviews that research report.

Interviewee	Profession	
1	Author	
2	Doctor	
3	IT technician	
4	Receptionist	

- Provide a clear visual representation of this data.
- What alternative suitable method could have been used?
- Justify why you have chosen to communicate the data in this way.

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## **Preview of Questions Ends Here**

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## Topic Test 2: Performance Characteristics of Materials

1. Wood, timber, or wood pulp.
2. Cartridge paper is used when sketching with pencil or hand rendering (1) because of its rough texture. (1)
3. **Allow 1 mark for correct benefit, a further 1 mark for explanation.**

**Answers may include:**

- Thermoplastic elastomer has a high elasticity (1) ideal to be used under compression.
- Thermoplastic elastomer has a friction texture (1) which is hard to achieve with other materials.

**Allow any other valid points.**

4. A smart material reacts to an external stimulus (1) and in response has a suitable output (1).
5. **Allow 1 mark for each correct benefit, give a further 1 mark for valid explanation.**

**Answers may include:**

- Can be deformed without breaking (1) increasing the product life. (1)
- Can be folded in a back pocket (1) improving the product functionality. (1)

**Allow any other valid points.**

6. **Allow 1 mark for each correct match.**

Sheet	Construction
Film	Injection moulding
Granules	Packaging
Rod	Structural support
Foam	Insulation
Powder	Material finishes

7. Valid application (1) Large-scale production considered (1)  
Correct stock form chosen (1) Annotated sketching (1)  
Correct forming method (1) Clear annotated sketching (1)

8. **Valid polymer classification (1) Correct polymer example (1)**

**Answers could include:**

- Thermosetting (1) Epoxy resin (1)
- Thermoplastic (1) LDPE (1)
- Elastomer (1) TPE (1)
- Biodegradable (1) Biopol (1)

9. **Correct example (1) valid benefit (1) correct explanation (1)**

**Answers may include:**

Oxy-degradable (1) is beneficial for packaging (1) because it degrades by itself in a correct environment (1)

10. **Allow 1 mark for each correct example.**

**Answers may include:**

- Glass-reinforced plastic
- Tungsten carbide
- Aluminium composite board
- Reinforced concrete

**Allow any other valid answers.**

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11. Allow 1 mark for each correct box filled.

Composite	Property
Carbon-fibre reinforced plastic	Lightweight
Glass-reinforced plastic	High compressive strength
Reinforced concrete	High-tensile strength
Tungsten carbide	Temperature resistant

12. i) Allow 1 mark for each correct answer, give a further 1 mark for valid answers could include:

- Kevlar is lightweight (1) making it ideal for manual labourers to be able to handle easily. (1)
- Kevlar is very tough (1) which gives the user protection against sharp objects. (1)
- It is a very durable material (1) which will make the gloves last a long time. (1)
- Kevlar can be coloured (1) which means a brand identity can be achieved. (1)

ii) Correct application (1)  
Correct property (1)  
Valid explanation (1)

13. Net design in two separate components (1)  
Design suitable for six-sided shape of base (1)  
Annotated suitable material (1)  
Dimensions of candle taken into consideration (1)  
Size of package suitable size to store candle (1)  
Internal support for candle considered to prevent damage (1)

Suitable material (1)  
Suitable material (1)  
Suitable material (1)  
Annotated (1)  
Clearly presented (1)

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## **Preview of Answers Ends Here**

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