

[C024/SQP010]

Higher
Craft and Design
Specimen Question Paper

Time: 2 hours 30 minutes

NATIONAL
QUALIFICATIONS

80 marks are allocated to this paper.

Where appropriate you may use sketches to illustrate your answer.

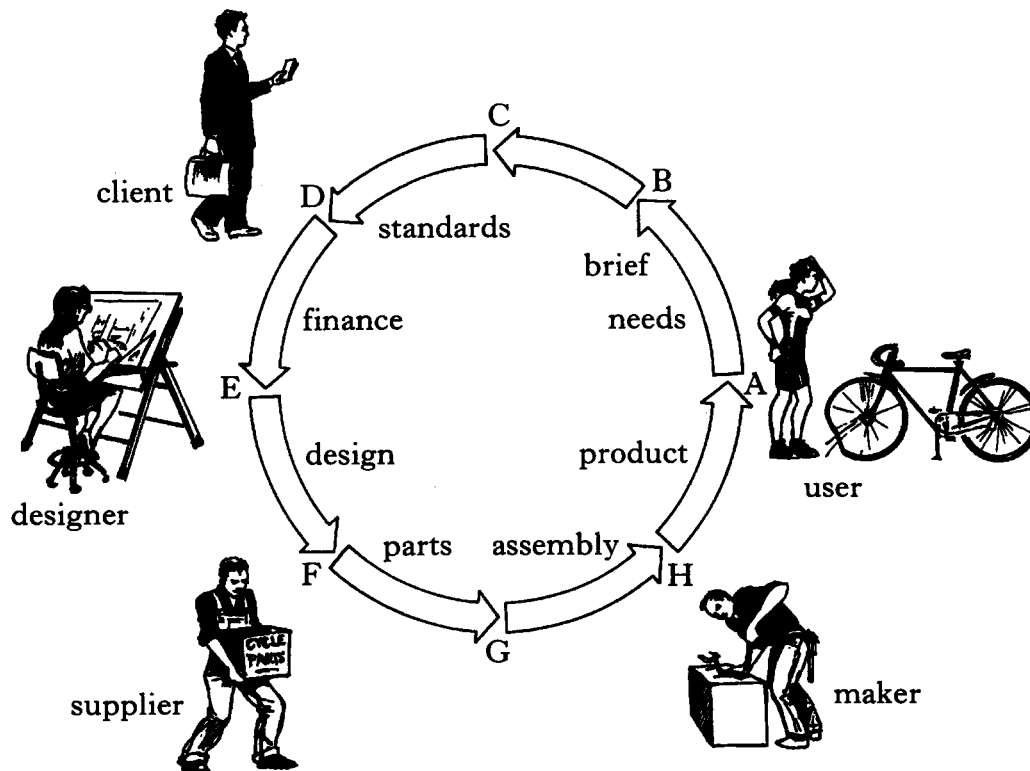
Attempt ALL questions

Marks

1. (a) Manufacturing companies are now choosing micro-processor control as a means of integrating all stages of design, manufacture and marketing.
State **two** advantages that this type of integration can give a company. 2
(b) Briefly describe what is meant by CADAM **within** a fully integrated production control system. 2
(4)

2. In order to survive the recession, many manufacturing companies considered diversifying into new areas of business.
(a) Discuss how market research could help companies in this situation. 4
(b) Discuss how analysing products produced by other companies could be useful. 4
(8)

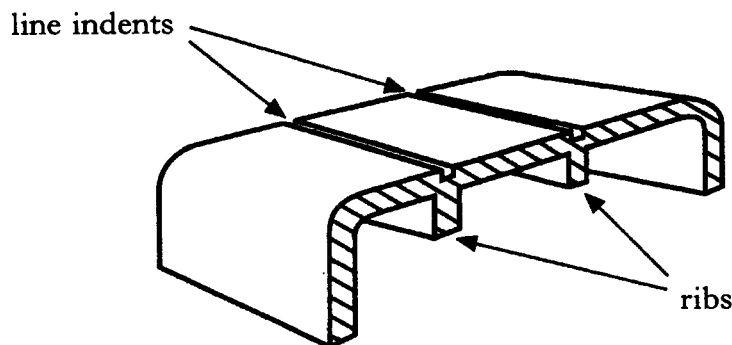
3. The partially completed diagram shows the product design cycle.



- (a) In which of the spaces B, C or G should the following groups of people be placed?
(i) Market Researcher
(ii) Product Engineer 2

- (b) Describe the relationship between:
(i) the designer and market researcher;
(ii) the designer and product engineer. 6
(8)

4. For the processes of “die-casting” and “vacuum forming”:
- (a) state **two** products manufactured by **each** process; 4
 - (b) explain why a designer would choose these processes; 2
 - (c) state a material that is suitable for **each** process. 2
- (8)
5. An important part of the design process is the “selection of a suitable finish” for a product.
- “Visual appeal” is one issue that a designer must consider when specifying a suitable finish for a product.
- For **each** of the following, state **two other** issues.
- (a) A toy for a young child 2
 - (b) A hardwood window frame 2
 - (c) A pressed steel car body panel 2
 - (d) An aluminium soft drinks can 2
- (8)
6. A part section of a pocket calculator case lid is shown in the diagram. The lid “clips” over the calculator.



The lid has been produced by injection moulding.

- (a) Describe briefly the process of injection moulding. Use sketches to illustrate your answer. 5
 - (b) Name a suitable plastic for this item and give a reason for your choice. 2
 - (c) Give a reason other than aesthetics why the designer has incorporated the line indents over the strengthening ribs. 1
- (8)

7. Human factors (ergonomics) are a prime consideration for a designer. The designer requires to refer to a selection of various types of data.

Two of the major areas considered are *anthropometrics* and *physiology*.

(a) Figure 1 shows part of a table of anthropometric data that might be used.

Figure 1

		Men			Women		
		5th % le 55	50th % le 75	95th % le 94	5th % le 44	50th % le 63	95th % le 81
1	Stature	1625	1740	1855	1505	1610	1710
2	Eye height	1515	1630	1745	1405	1505	1610
3	Neck height	1375	1485	1595	1280	1375	1470
4	Shoulder height	1315	1425	1535	1215	1310	1405
5	Chest (bust) height	1175	1270	1365	1080	1170	1255
6	Elbow height	1005	1090	1180	930	1005	1085
7	Hip height	840	920	1000	740	810	885
8	Knuckle height	690	755	820	660	720	780
9	Fingertip height	590	655	720	560	625	685

- (i) With reference to Figure 1, explain the meaning of:

5th percentile;

50th percentile;

95th percentile.

3

- (ii) Describe how such figures could be used by the designer.

3

- (b) Physiology (the study of the body's responses, limitations and capabilities) is the other important area.

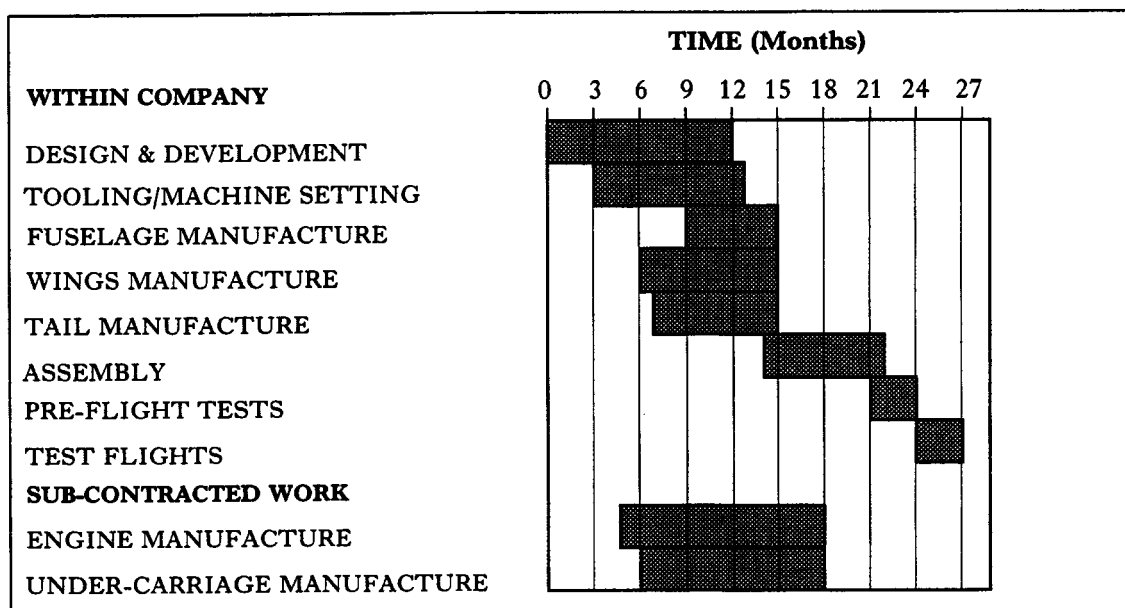
Strength is one aspect of physiology. Give **two** others.

2

(8)

8.

PROJECT PLANNING CHART



The above project planning chart covers the major stages in the design, manufacture and assembly of a new jet aeroplane.

- (a) Briefly explain why companies use this type of planning chart. 2
- (b) From this chart, how many months are required to carry out:
- (i) the manufacture of all body parts (fuselage, wings and tail); 1
 - (ii) the installation of the engines and undercarriage, during the assembly stage? 1
- (c) What is meant by “sub-contracted work”? 1
- (d) State **two** reasons for using sub-contractors. 2
- (e) State an advantage of using “just-in-time” production control. 1
- (8)**
9. Many manufacturing companies have recognised the need to diversify and produce new products in order to sustain growth. In some cases the new products are quite different from the company’s established market.
- A particular company is considering extending its range of products from electric kettles, irons and toasters to include audio equipment such as midi-hifis.
- (a) Discuss the implications of this change for:
- (i) the company’s policy for investment in manufacturing machinery; 2
 - (ii) the make up of the product design teams and the management of these teams; 2
 - (iii) the use of specialist staff, both from within and outwith the company. 2
- (b) How is this change likely to affect the production workers? 2
- (c) How might the company try to maintain its good reputation as it moves into a new product area? 2
- (10)**

10. Situation

The owners of a small, specialised apple orchard sell their apples claiming they are “**high quality, individually picked and packaged**”.

This method and the care taken in picking the apples is appealing to more and more consumers.

Because the apples are **individually handled** they are near perfect with no bruising. Hence it is essential that the apples are not allowed to fall against other apples or to fall to the ground and that they are carefully and immediately packaged.

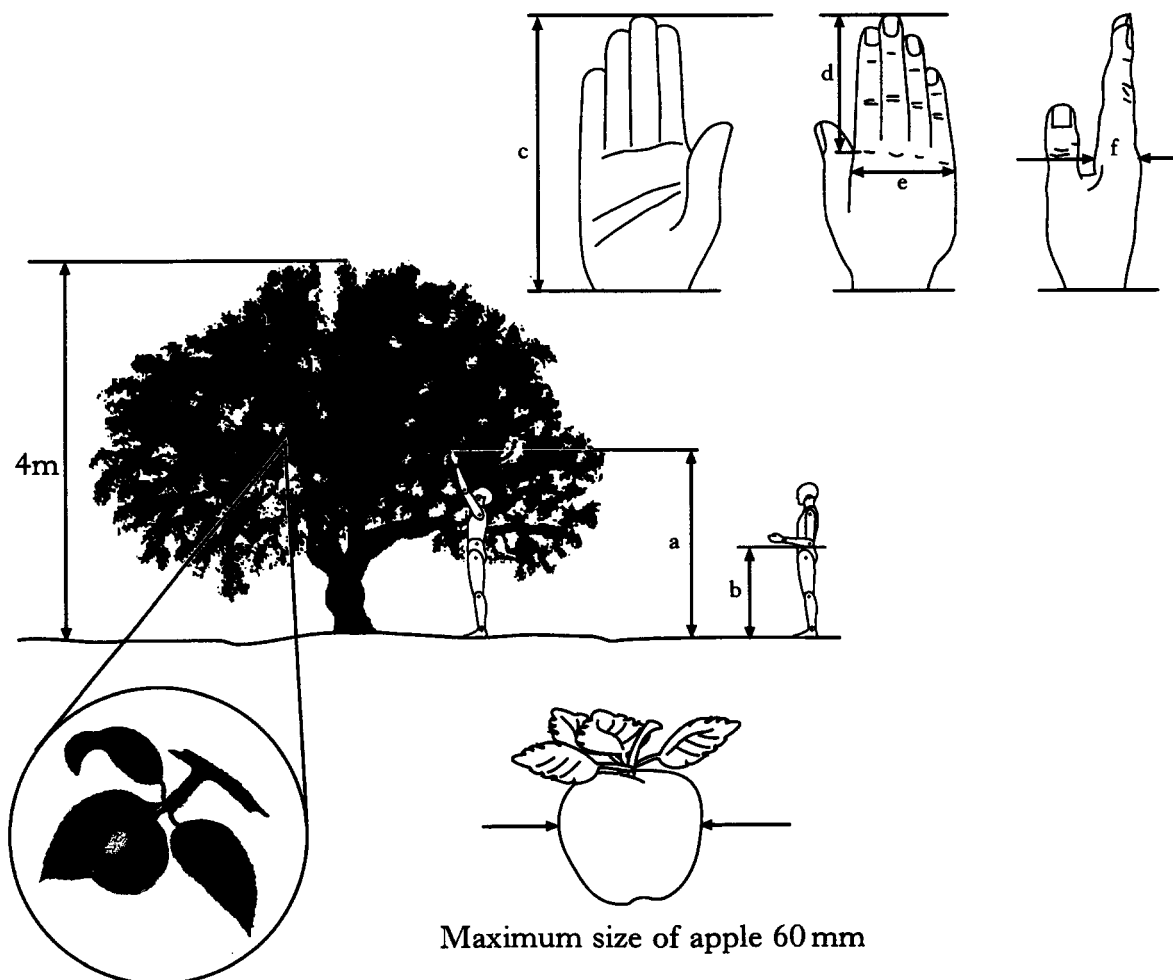
The pickers can only reach the apples on the lower branches of the tree. Reaching the fruit on the upper branches is a major problem. Ladders, scaffolds and platforms have proved awkward and unsafe to use on the uneven ground.

Some details and reference sizes are shown below.

Your task is to analyse the situation described and produce a design specification for a hand held device which would enable the pickers to reach the apples on the upper branches. The device must allow the picker to use the same care that would be shown if the apple was being picked by human hand.

(a) Produce an **initial analysis** of this problem. (7)

(b) Prepare a comprehensive **design specification** of at least 6 key points. (3)



[END OF QUESTION PAPER]

[C024/SQP010]

Higher
Craft and Design
Specimen Marking Instructions

NATIONAL
QUALIFICATIONS

Higher Craft and Design

Specimen Marking Instructions

- 1 (a) Reduced labour costs, lower failure rate, quicker product cycle/response time, longer tool life, flexibility of design, more competitive, more accurate records, more precise predictability, better products, better support. Easier to correct mistakes, improved design team communication, saves time, storage systems.

2 @ 1

- (b) Manufacturing machinery controlled by a computer that also controls the production design and the product testing. Feedback from each section. CNC lathe on its own 1 mark. Linking required for full marks (previous or following stage).

2 @ 1

- 2 (a) No one word statements as “discuss” was asked for.

Identification of new markets
Identification of new products
Identification of consumer demand
Identification of consumer expectations for pricing of products
Market trends

etc

Mark on scale 4 - 3 - 2 - 1 - 0

- (b) Product analysis
Could use Design headings

Look at

Production methods
Construction
Durability
Aesthetics
Value for money
Copyright – copying

From this produce products similar but improved and at a competitive price.
Find ideas for new generation of product.

Mark on scale 4 - 3 - 2 - 1 - 0

- | | | | | | |
|---|-----|------|--------------------------------|---|--------|
| 3 | (a) | (i) | Market Researcher | B | 1 mark |
| | | (ii) | Product Engineer | G | 1 mark |
| | (b) | (i) | Designer < > Market Researcher | | |

M.R.

Helps to identify needs
 Information to public
 Information to Industry

Designer

Uses information from M.R. to update products
 Gives M.R. information on future developments
 Upgrades products to suit public demand

1 mark/reason

- (ii) Designer < > Product Engineer

Designer

Must have awareness of production process
 Give P.E. information on ongoing developments
 Negotiate on ongoing production problems

Product Engineer

Give information on new plant required
 Suggest modifications to ease manufacture
 Keep designer informed about new production techniques

1 mark/reason

Dialogue must be two way for full marks.
 Do not accept sends plan to P.E.

Total 6 marks

- 4 (a) *Die-cast products:*
Tools, motor/pump parts – domestic products,
toys, jewellery, drawing instruments etc **2 @ 1**
- Vac. Formed products:*
Bathroom/ kitchen fittings, toys, packaging **2 @ 1**
- (b) Reason for *Die-casting*:
Good finish, ease of mass production
precision of end product **1 @ 1**
- Reason for *Vac-forming*:
Ease of production, economy of production **1 @ 1**
- (c) Materials for *Die-casting*:
Aluminium and its alloys, low carbon steels
Composites. **1 @ 1**
- Materials for *Vac-forming*:
Any thermoplastic sheets – PVC, polyethylene
Acrylic, ABS etc. **1 @ 1**
- 5 (a) Finish for a child's toy:
Toxicity, smooth edges, easy to clean etc. **2 @ 1**
- (b) Finish for a hardwood window frame:
Resistance to decay, ease of application **2 @ 1**
- (c) Finish for a pressed steel car body panel:
Resistance to corrosion, chipping etc. **2 @ 1**
- (d) Finish for an aluminium soft drinks can:
Effect on contents, resist corrosion etc. **2 @ 1**
- 6 (a) Thorough description of process/including annotated sketches
Mark on scale (5 - 4 - 3 - 2 - 1 - 0)
No sketch – maximum of 2 marks.
- (b) Suitable plastic – any thermoplastic material. Must name material. **1**
- No acrylic unless extruded specified
Reason to match process **1**
- (c) Shrinkage, appearance
Uses less material. Flexibility. **1**

7	(a)(i)	5th %ile 50th %ile 95th %ile	Bottom 5% of range Mid-range or average of range Top 5% of range	eg: very short people eg: average height people eg: tallest people	3
	(ii)	The designer will need to consider these tables to ensure: Suitability for the “whole range” if required If compromise is necessary then the 50th %ile should be referred to Implications of such a compromise			3
			Explanation with reference to all three areas		3
	(b)	Aspects of physiology:	Visual range Range of movement/reach/turn/etc Fatigue/stamina Any physical limitation	Any two	2
8	(a)	Why use the planning chart?	Efficient project management Forward planning Economic use of plant/space/staff Getting the product out on time Easier communication		2 @ 1
	(b)(i)	9 months			1
	(ii)	4 months			1
	(c)	Use of other companies to manufacture components/sub-assemblies etc			1
	(d)	Plant/space saving, specialisms, investment, etc skills time, To make up lost time, shared risk, no need for extra workers.			2 @ 1
	(e)	Space saving, efficient production, no storage, low investment.			1
9	(a)(i)	Investment in: development time, machinery, staff training, production, risk, subcontract, new/extended building.			2 @ 1
	(ii)	New specialist required, new markets, unknown – fear of change, retraining. No one word answers.			2 @ 1
	(iii)	Sub-contractors, wider field of management, marketing techniques, public relations, increased cost initially finding skills – recruitment.			2 @ 1
	(b)	Re-training, morale, numbers, salaries, security, stress.			2 @ 1
	(c)	Good marketing, thorough product development, after sales. Value for money, keeping good name, good employer image, sponsorships, protect existing products, extended guarantees.			2 @ 1

10 An analysis of the major issues to include any six of:

- a) The issue of
 - picking the apple off the tree without damage
 - size of the apple
 - holding/gripping the apple
 - getting the apple down to allow packaging
 - the picker at one end of the product and the apple at the other
 - reach and the height of the apples
 - accessibility of the apples
 - operating the product from the ground
 - anthropometric details of the hand
 - ergonomics of reaching/balancing/operating the product
 - the product being used by a range of men and women
 - portability and storing of the product
 - the strength and weight of the product etc.
 - avoid apples falling to ground
 - how to get apple from device
 - mind map – limbs extended
 - reasoned valid developed topics on or from mind map

Production of a mind map alone does not constitute a complete analysis.
mind map only max marks 3

7 points @ 1

- b) eg The device must be able to
remove the apples without bruising
reach all the apples
individually handle the apples
be used by a range of pickers male and female
be used without physically straining the picker
be easy to use
be easy to store if is long
be safe to use
etc

Specification must be relevant to problem and include an explanation for inclusion of each point.

6 points @ $1/2$

[END OF MARKING INSTRUCTIONS]

Unit	Time %	Target marks	Actual Marks	Comments
Product Design and Graphic Techniques	15%	8		
Designing for People	37.5%	32		
Designing for Manufacture	37.5%	32		
Product Model	10%	8		

Exam Paper Design Grid

	Product Evaluation		Designing for People				Design for Manufacture			Product Model		
Question	Product Evaluation	Graphic Techniques	Factors Influencing Design	Product Design	Design Spec	Design for People	Materials and Manufacture Process	Select Materials Processes	Investigate and Develop Ideas	Planning	Construction	
Marks		Folio							Folio		Final Product	Total 80

Exam Paper Design Grid

	Product Evaluation		Designing for People				Design for Manufacture			Product Model		
Question	Product Evaluation	Graphic Techniques	Factors Influencing Design	Product Design	Design Spec	Design for People	Materials and Manufacture Process	Select Materials Processes	Investigate and Develop Ideas	Planning	Construction	
1							4					
2	8											
3				8								
4							6	2				
5								8				
6			1				5	2				
7						8						
8										8		
9			10									
10					10							
Marks	8	Folio	11	8	10	8	15	12	Folio	8	Final Product	Total 80

