

Examiners' Report  
June 2014

GCE Design & Technology 6GR03 01

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## Introduction

The examined unit covers knowledge and understanding of a range of modern design and manufacturing practices and contemporary design issues. This includes a good working knowledge of the use of ICT, systems and control technology and industrial production systems in the design and manufacture of commercial products. Additionally, candidates need to be aware of important contributions by designers from the past which may provide the inspiration for future designs. Candidates also need to know that sustainable product design is a key feature of modern design practice.

More able candidates performed well across the paper demonstrating detailed knowledge and understanding of key concepts and content. They were able to:

- Analyse and respond appropriately to the command verb used in the question
- Read the question carefully and respond appropriately to the specific focus or scenario of the question
- Draw upon detailed knowledge of the specification content
- Demonstrate understanding of the design movements including their design style and philosophy
- Demonstrate a sound understanding of modern industrial production systems
- Demonstrate understanding of the benefits of sustainable design practice.

Less able candidates:

- Provided more generic responses rather than focusing upon the specific requirements of the question
- Were not able to differentiate between different industrial production systems and provided confusing answers
- Relied upon knowledge recall rather than application.

Candidates need to have covered all areas of the specification in detail and be able to differentiate between key technologies. Centres are encouraged to place increased emphasis on production systems as each year this proves to be a problem area for many candidates.

Overall the paper performed well and in line with previous examination series providing appropriate content and rigour across the ability range.

## Question 1 (a)

Candidates generally performed reasonably well on this question and had good knowledge and awareness of the use of thermochromic pigments in a range of household products. Most candidates were aware of the colour changing kettle that indicates when the kettle is hot, bath toys that indicate a safe water temperature for infants and the use of forehead thermometers. Other responses included novelty mugs, children's cutlery and to indicate the correct storage temperature for food.

Some candidates applied their knowledge of applications in common products such as the Duracell battery with a power level indicator and beer cans that indicate when the beer is at the correct temperature.

**Answer ALL questions. Write your answers in the spaces provided.**

**1** Thermochromic pigments have many innovative applications.

(a) Outline the household applications of thermochromic pigments.

(4)

Thermochromic pigments are a type of smart material that changes colour in response to temperature. The main household appliance that there would be used for is the Russel Hobbs kettle which changes from blue to pink when water is boiled. Other applications could include taps to indicate when hot water is flowing through. Pigments could also be used on radiators to indicate when the radiator is hot.



**ResultsPlus**  
Examiner Comments

This response was awarded two marks. The candidate has correctly outlined two correct household uses of thermochromic pigments, i.e. the colour changing kettle and radiator stickers that warn when the radiator is hot. The candidate has introduced the response with an explanation of thermochromic pigments, this was not necessary and did not attract any marks.



**ResultsPlus**  
Examiner Tip

Candidates should not write unnecessary introductions to questions as they will not attract additional marks. In a four mark 'outline' question try to provide four key points.

## **Question 1 (b)**

A large proportion of candidates performed well on this question. Most candidates recognised the indication of a safe temperature, and an aesthetic or novelty value as benefits or advantages. The more able candidates were able to consider the difficulties in obtaining a precise reading and the limited colour range available. The most able candidates discussed the difficulties in 'engineering' or matching a temperature range to a range of colours.

Some candidates discussed expense but did not link the expense to a product such as a forehead strip thermometer being cheaper than a traditional glass thermometer or a novelty mug being more expensive with photochromic pigments than without.

Other common responses included becoming less effective over time and being slow to react in some applications.

## Question 2 (a)

Some candidates did not find this question easy and focused only upon sustainable development in emerging economies. Candidate responses were often very generic and rarely went beyond the need to reduce global warming. More able candidates considered reducing the depletion of scarce resources and safeguarding resources for future generations.

## Question 2 (b)

Most candidates scored reasonable marks on this question indicating that they have good knowledge and understanding of specific sustainability issues. They were able to link the widespread use of non-organic polymers to: emissions during production; depletion of oil reserves; increased use and impact upon landfill sites; discharge of toxic gasses when being burnt etc. The more able candidates considered the impact of oil exploration and further environmental impacts when opening up new landfill sites.

(b) Outline the environmental impact caused by the widespread use of non organic polymers in today's "throw away" society. (5)

- less space in landfills as non organic polymers never decompose
  - non organic polymers that get thrown away wastes precious oil that was used to make them.
  - non organic polymers that end up in the sea don't decompose and ~~pollute~~ and damage sea life
  - the more non organic polymers we throw away the more new polymers we have to make which means more oil has to be extracted, this contributes to the greenhouse effect.
  - ~~the more non organic~~ polymers that are ~~thrown away~~ <sup>littered</sup> and end up in bushes, fields, forests etc damage wildlife and interfere with the ecosystem, animals can get trapped in them or eat them and die.
- (Total for Question 2 = 8 marks)



**ResultsPlus**  
Examiner Comments

This is an 'outline' question and here the candidate has not wasted space on unnecessary narrative. A range of key marking points have been addressed and the candidate has been awarded the full five marks.



**ResultsPlus**  
Examiner Tip

For outline questions candidates should consider as many key points as possible.

### Question 3 (a)

Candidates found this question rather difficult. Most acknowledged the increased use of mechanisation as the reason for the increased demand for energy. More able candidates also considered 24/7 working and mass production together with more centralised production resulting in increased transportation requirements.

### Question 3 (b)

Most candidates answered this question very successfully and considered a range of advantages and disadvantages of using water as a form of energy. It was common for candidates to identify hydroelectric power as a source of energy. They went on to consider the advantages of recreational use of the reservoirs and protecting rivers from flooding during times of heavy rainfall. Common disadvantages included: the flooding of farmland; relocation of communities; the risks associated with catastrophic failure of the dam; impact on wildlife and eco systems; and the high initial set up costs.

Generally, candidates did not have a good understanding of tidal or wave power.

Hydro electric power is a source that utilizes water as a renewable energy. The advantages are that hydro electric power recovers its construction money quickly, as it produces a lot of ~~power~~<sup>energy</sup>. The system can also protect towns downstream from floods. But the disadvantages are that they have to flood a large area of land to create a reservoir - this causes local people to relocate. It also means that they are destroying habitats, i.e. Birdlife.

(Total for Question 3 = 8 marks)



**ResultsPlus**

**Examiner Comments**

This is a very good response that was awarded the full five marks covering a range of appropriate marking points including key advantages and disadvantages.



**ResultsPlus**

**Examiner Tip**

Read the question and plan your response. When the question is an evaluation question try to get an even balance of benefits and drawbacks.

## Question 4

The majority of candidates achieved between three and four marks for this question and demonstrated a good understanding of sustainability issues. Common responses related to reductions in the demand for harvesting trees, the subsequent minimisation of impact upon animal habitats, reduction in landfill and the reduced energy requirements/emissions attributable to the felling and processing of timber. Higher level responses also considered that the reduction on the number of trees being felled helped to maintain CO<sub>2</sub> conversion.

Advantages of recycling paper would be that no raw materials have to be used to create new fresh paper. ~~The~~ ~~it~~ ~~is~~ ~~using~~ ~~so~~ ~~much~~ Recycling paper doesn't use as much paper energy as starting from scratch. The process isn't as long as having to make paper from scratch. It will mean that landfill will be reduced as paper isn't thrown away it is put in the recycling bin.



### ResultsPlus Examiner Comments

This shows a typical candidate response that was awarded a total of three marks including:

- Reduced need for new raw materials
- Recycling uses less energy than new production
- Landfill will be reduced.



### ResultsPlus Examiner Tip

Focus on the question. Here only advantages need to be considered, there are no marks awarded for disadvantages.



### Question 5 (a)

This question polarised candidate responses, in that they either knew it, or did not. Candidates providing the correct answers tended to produce very good responses generally focusing on the use of teamwork as a feature of concurrent manufacturing.

Candidates on this qualification often find difficulty with questions relating to industrial production and development.

### Question 5 (b)

This question is about Quality Function Deployment and produced some very generic responses relating to mass/batch production that gained little if any credit for this question. Candidates who showed an awareness of this topic tended to focus on 'getting the product right first time' and 'improving customer satisfaction'.

1. It checks the quality of the function to make sure it is manufactured well.
2. QFD allows ~~the~~ to help with the development to make any changes or adjustment.



#### ResultsPlus Examiner Comments

This response was awarded zero marks as it has only used key words from the question in an attempt to present an answer.



#### ResultsPlus Examiner Tip

Do not repeat aspects of the question in your response.

### Question 5 (c)

This question produced some reasonable responses and candidates were generally able to differentiate between Flexible Manufacturing systems and other production systems. Many candidates made reference to both routing flexibility and machine flexibility together with the ease of reprogramming machines within the system.

## Question 6 (a)

This question was not well answered and clearly indicated that most candidates had limited knowledge of Enterprise Resource Planning (ERP). However, candidates who did gain marks on this question recognised that all data is available to everyone involved in using the common computer system. Many candidates who had responded positively referred to a software road map for fulfilling customer orders.

## Question 6 (b)

A general lack of understanding of production and commercial systems is emphasised by candidate performance on this question. Candidates had many misconceptions which considered automated systems to

monitor stock and reorder, or that ERP is a feature of JIT. Where candidates did show an understanding, a typical response would relate to improved customer satisfaction, and being able to fulfil orders more quickly. Where candidates did score marks it tended to be for the more generic answers relating to high initial cost and potential system failure.

Candidates are encouraged to gain a greater understanding of commercial systems and need to focus on specific systems. This is a key area for improvement in candidate performance. At the moment responses are far too generic.

(b) Evaluate the advantages and disadvantages a business would experience by using enterprise resource planning (ERP).

(6)

There are several advantages for a company to use enterprise resource planning, some of which include: The financial benefits from knowing how much you need to buy to make your target unit production, The impact on the environment your company makes will be improved due to the reduction of waste material.

As there are several ~~disadvantages~~ advantages for a company to use ERP, there are also several disadvantages. Such as: It is possible that the cost of using enterprise resource planning will not be covered by profits as the company didn't sell enough, It takes you longer to design and manufacture a product as you need to wait for ~~the~~ the ERP to finish.



**ResultsPlus**  
**Examiner Comments**

This is a typical candidate response to this question. There is very little to credit here and the only mark that could be awarded is for the recognition of the high initial cost.



**ResultsPlus**  
**Examiner Tip**

Thorough in depth revision of all aspects of the specification is required.

## Question 6 (c)

This question is about the concerns that consumers might have when making purchases online. Candidates overall performed exceptionally well on this question with the majority of candidates achieving the full four marks. This may well reflect society's move towards internet purchasing and the real life experience of the candidates.

Typical responses included: wariness of entering personal details; items not being as advertised; products not being delivered or damaged during delivery; being 'scammed' by fraudsters and the potential for unsolicited spam mail.

(c) Discuss the concerns that consumers might have when purchasing items online. *(Answer runs beyond line at bottom of page)*

(4)

consumers may not be / feel safe and may be at risk  
When purchasing <sup>items</sup> online as they are entering their bank  
(account) details and other forms of contact ~~information~~ which  
could all be potentially accessible by another person. Any  
private or confidential details are at risk of being attained  
by someone else over the internet. When purchasing items  
online, ~~they~~ <sup>customers</sup> are unable to physically assess / observe the item  
they are buying / try on clothes (for example) they are buying  
online - it is not the same "fulfilling" experience as going to a store  
and purchasing something / an item in person. This could result in problems  
concerns of returning the online-bought item. <sup>increasing time and money spent</sup> Buying items online can  
also result in long delivery / waiting times due to logistics process (warehouse  
distribution, then delivery etc.) which can be a <sup>concern</sup> (Total for Question 6 = 12 marks) <sup>it could also</sup>

be argued that shops have a wider variety of items for purchase (in  
some cases) and it would be, thus more practical and convenient  
for the consumer to buy items ~~in~~ in-store rather than online.  
Buying online, may result in the consumer receiving the wrong  
item, or the item may not be as they expected (slight visual  
variations from the images online from website).



### ResultsPlus Examiner Comments

This very successful response scored four marks. It exceeds the number of marking points required to achieve full marks for this question.



### ResultsPlus Examiner Tip

Try to present your answer in the space provided. However, you are advised to use an additional answer booklet if you need to extend your answer beyond the allocated space on the examination paper.

### **Question 7 (a)**

This question is about the use of computer generated images (CGI) in car driver simulators. The most common response was how CGI allows hazardous driving situations to be simulated. However, a number of candidates produced generic 'textbook' responses about CGI but did not focus on the question scenario.

### **Question 7 (b)**

This question is about how computer aided design and manufacture have enabled designers to produce creative designs faster and at lower cost than by using traditional drawing methods.

Candidates now have a clear understanding of CAD and CAM and most were able to provide a broad range of responses in line with the mark scheme. Candidates generally did very well on this question demonstrating a clear understanding of CAD and were able to focus their response on the specifics of the question.

Some candidates considered CAM in too much detail. Within the context of this question CAM is relevant to prototyping and more specifically rapid prototyping. It was not helpful for candidates to discuss the disadvantages of CAD-CAM when the focus of the question was on the benefits and advantages of CAD-CAM over traditional drawing methods.

\* (b) Discuss how computer-aided design and manufacture (CAD/CAM) have enabled graphic designers to produce creative designs faster and at lower cost than by using traditional drawing methods.

(8)

CAD is capable of quickly creating designs that can be seen from every angle, meaning that, unlike traditional drawing methods, the design does not need to be drawn from different angles. These CAD designs can be sent to clients quickly via E-mail to quickly receive feedback (faster than posting drawn designs). CAM allows for rapid prototyping, eliminating the need for other specialist skills and equipment. This reduces the cost of creating the prototype. CAM can also be used with cheap materials such as polymers, which also reduces cost. Rapid prototyping via CAM methods is much quicker than traditional prototyping methods, meaning that feedback can be received quickly. After the feedback, the CAD design is easily

(Total for Question 7 = 12 marks)

edited rather than the designs having to be completely redrawn. Even more time is saved when trying to access ~~the~~ CAD design files, computers allow quicker access than traditional filing methods for paper designs.



**ResultsPlus**

**Examiner Comments**

This is a successful response that was awarded a total of six marks. More focus on the tools and techniques available within CAD packages, such as rendering, chamfering and manipulation tools would have lifted the response to the maximum mark of eight.



**ResultsPlus**

**Examiner Tip**

Remember to read the question carefully and focus on the specific scenario

It is a good idea to underline the key words in the question

Revisit the question part way through your response to check your answer is relevant.

## Question 8

This question provides the option of considering two different design movements, either; The New Design Style (Post Modernism) or The Art Deco Movement. In each case candidates needed to cover both the philosophy of the movement and the design style. The most popular option was The New Design Style with candidates having a good knowledge of the design philosophy of Philippe Starck and the design of his most well-known artefacts. Most candidates scored well on this question with the more able and better prepared candidates collecting full marks by exhibiting excellent and detailed knowledge of the design movement.

\*8 Throughout history, design movements have influenced the development of products.

Discuss how the philosophy and design style of **one** of the following has influenced the development of products:

- the New Design Style (post-modernism)
- the Art Deco movement

Design movement: the New design style

The post-modernism design movements has been influenced by philippe Starck. He has designed for Microsoft, the mouse and also Alessi. The style of post-modernism can be identified through retro, using old designs and incorporating them with new materials and new technology to still keep it in the modern age. Post-modernism was a rebellion against modernism instead of symmetrical shapes it used humour and personality in its designs. Incorporating personality made products more ~~des~~ of a desire object as consumers wanted to express their personalities through their products to say what kind of person they were. This design style also ~~was~~ can be identified by deconstructionism, buildings/architecture was left with pipes etc showing to suggest a controlled chaos. Bright colours and unique shapes have influenced many products as it wanted to leave the modernism movement in the past.



**ResultsPlus**  
Examiner Comments

This response was awarded full marks. The candidate has clearly discussed both the philosophy and design style of the movement covering a broad range of marking points. Here you can see that the candidate has underlined key words in the stem of the question.



**ResultsPlus**  
Examiner Tip

Carefully read the question and decide what type of response is required.



## Paper Summary

Based on their performance on this paper, candidates are offered the following advice:

- Gain an understanding of the use of command verbs in examination questions and the type of expected response
- Read the question thoroughly so you understand the focus of specific questions
- Avoid the temptation to write all you know about a generic topic area
- Revise the full breadth and depth of the specification
- Use the learning opportunities presented during the completion of coursework to help prepare for the examination.

## Grade Boundaries

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