



MARKSCHEME

November 2013

DESIGN TECHNOLOGY

Higher Level

Paper 3

*This markscheme is **confidential** and for the exclusive use of examiners in this examination session.*

*It is the property of the International Baccalaureate and must **not** be reproduced or distributed to any other person without the authorization of the IB Assessment Centre.*

Subject Details: Design Technology HL Paper 3 Markscheme

Mark Allocation

Candidates are required to answer questions from **ONE** of the Options [**1 × 40 marks**].

Maximum total = **[40 marks]**

1. A markscheme often has more marking points than the total allows. This is intentional.
2. Each marking point has a separate line and the end is shown by means of a semicolon (;).
3. An alternative answer or wording is indicated in the markscheme by a slash (/). Either wording can be accepted.
4. Words in brackets () in the markscheme are not necessary to gain the mark.
5. Words that are underlined are essential for the mark.
6. The order of marking points does not have to be as in the markscheme, unless stated otherwise.
7. If the candidate's answer has the same "meaning" or can be clearly interpreted as being of equivalent significance, detail and validity as that in the markscheme then award the mark. Where this point is considered to be particularly relevant in a question it is emphasized by **WTTE** (or words to that effect).
8. Remember that many candidates are writing in a second language. Effective communication is more important than grammatical accuracy.
9. Occasionally, a part of a question may require an answer that is required for subsequent marking points. If an error is made in the first marking point then it should be penalized. However, if the incorrect answer is used correctly in subsequent marking points then **follow through** marks should be awarded. When marking indicate this by adding **ECF** (error carried forward) on the script.
10. Do **not** penalize candidates for errors in units or significant figures, **unless** it is specifically referred to in the markscheme.

Option A — Food science and technology

1. (a) *Award [1] for stating one reason for freezing food apart from reducing waste.*
buy in bulk/save money;
have unconsumed food available for another occasion;
convenience;
extend shelf life; **[1 max]**
- (b) *Award [1] for a reason why it is recommended that when frozen food is defrosted it should be used on the same day and [1] for a brief explanation [2 max].*
freezing does not kill microorganisms;
once defrosted any microorganisms which were on the food will continue to grow;

it will taste better/fresher;
minimize further deterioration in the quality/taste/texture/colour of the food; **[2 max]**
- (c) *Award [1] for each of three distinct points in an explanation of one benefit of the new labelling advice apart from stopping enormous amounts of food being wasted each year [3 max].*
to comply with standards/best practice;
food retailers should provide suitable guidance to consumers on how to use their products;
if no guidance is provided consumers may not use products safely/wisely;

image/reputation;
food retailers demonstrate corporate social responsibility;
attractive to environmentally conscious consumers/market pull;

reduced need to produce as much food;
reduced carbon and water footprint for food production and distribution;
better use of (non-renewable) resources; **[3 max]**
2. (a) *Award [1] for a definition of food security to the effect of:*
adequate levels of food intake to maintain a healthy and active life; **[1 max]**
- (b) *Award [1] for identifying one way in which a government could assess if there is food security in its country and [1] for a brief explanation [2 max].*
data on the indicators of nutritional status of the population;
for example, prevalence of nutrition-related diseases/ patterns of disease;

data supplied by global agencies, for example, World Health Organization;
monitor food security in different countries; **[2 max]**

3. (a) *Award [1] for each of two distinct points in a description of the role of B vitamins for athletes [2 max].*
B vitamins are important for energy production;
they help release energy from carbohydrate/sugar; [2]
- (b) *Award [1] for each of two distinct points in a description of the importance of sodium and potassium for athletes [2 max].*
sodium and potassium are lost from the body in sweat during exercise;
they need to be replaced for the athlete to remain healthy;
- sodium - It helps regulate fluid balance and promotes proper muscle function;
potassium - It is important in the transmission of nerve impulses, the building muscle tissue and for the beating of the heart; [2 max]
4. *Award [1] for each distinct point in an explanation of each of two types of food spoilage [3 max] per type [6 max].*
physical spoilage;
protective outer layer of food is damaged, for example, by rough handling or pest damage;
increases the chance of microbiological or chemical spoilage;
- chemical spoilage;
leads to changes in the colour/taste of foods;
for example, rancidity of oils/fats;
- microbiological spoilage;
can be caused by bacteria, moulds or yeasts;
use the food as a substrate for growth; [6 max]
5. (a) *Award [1] for outlining one way in which food hygiene rating schemes help reduce the risk of food poisoning when eating out and [1] for a brief explanation [2 max].*
consumers can check out a food outlet before a visit;
they can avoid food outlets with (low) ratings of 0, 1 and 2; [2]
- (b) *Award [1] for identifying one reason why food safety officers check that food is properly cooked and [1] for a brief explanation [2 max].*
if not cooked properly any food poisoning bacteria are not killed;
if then stored incorrectly (warm/in the temperature danger zone) they can multiply; [2]
- (c) *Award [1] for identifying one reason why food safety officers check the layout of a food preparation area and [1] for a brief explanation [2 max].*
correct layout of food preparation areas reduces cross-contamination/the chances of raw uncooked food coming into contact with cooked food that is ready to serve;
raw uncooked food may be contaminated with food poisoning bacteria; [2]

6. (a) *Award [1] for each of three distinct correct points in an explanation of how technology push has enabled the production of genetically modified organisms [3 max].*

technology enables the identification and isolation of specific genes responsible for particular characteristics;

low market pull means low market demand/sales;

this makes the product not viable in marketplace;

so food retailers reduce/eliminate such products from stores;

[3]

- (b) *Award [1] for each of three distinct correct points in an explanation of one implication of low market pull for genetically modified foods, such as the Flavr Savr™ tomato [3 max].*

low market pull means low market demand/sales, this makes the product not viable in marketplace;

resulted in low market demand/sales;

so food retailers reduce/eliminate such products from stores;

[3]

7. *Award [1] for each distinct point in each of three ways in which on-farm processing can enhance the sustainability of the rural economy [3 max] per way, [9 max] total.*

processed foods command a higher price/cost more than unprocessed materials;

therefore farmers get a larger share of the food dollar;

this contributes to economic sustainability;

on-farm processing creates jobs in the rural economy;

therefore people do not have to migrate from rural areas to find jobs;

this contributes to social sustainability;

consumer confidence;

provenance is increasingly important for consumers;

knowing where and by whom the food was produced makes it more attractive to consumers;

on-farm processing reduces food miles/the distance that food travels from the production to consumption;

less energy is invested in the production/distribution of the processed food;

this contributes to environmental sustainability;

[9 max]

Option B — Electronic product design

8. (a) Award [1] for stating the type of digital logic gate on the chip shown in Figure B1.
NAND; [1]

- (b) Award [1] for constructing output Q of the truth table for the logic circuit shown in Figure B2 and [1] for output X.

A	B	Q	X
0	0	1	0
0	1	1	0
1	0	1	0
1	1	0	1

[2]

- (c) Award [1] for each distinct correct point in an explanation of one reason why a manufacturer might decide to use the quad logic chip shown in Figure B1 in circuit design [3 max].

NAND (and NOR) gates are universal logic gates/all digital logic functions can be implemented without using other gates;
the manufacturer would not have to hold different stock items;
the manufacturer might get a better price for buying components in bulk;

[3]

9. (a) Award [1] for stating one implication of the increasing file size of digital photographs.
higher resolution;
larger storage requirements;
faster data transfer requirements;
needs additional software to compress images for attachment to email/use on websites; [1 max]

- (b) Award [1] for identifying one benefit of converging technology for the use of digital photographs and [1] for a brief explanation [2 max].
compatibility/platform non-specific;
so can be used by various devices; [2]

10. (a) *Award [1] for resistance and [1] for identifying the range of resistance within which the resistance of R_2 lies including units [2 max].*
brown = 1, green = 5, orange = 3 0s so 15000 Ω gold = + 5% ;
142500 – 15750 Ω /14.25 – 15.75k Ω ; [2]
- (b) *Award [1] for showing the working and [1] for the correct answer [2 max].*
 $V_{out}/V_{in} = R_2/(R_1 + R_2)$;
 $R_1 = 7.5 \text{ k}\Omega$ therefore ratio is 7.5:15/1:2; [2]
11. *Award [1] for each of three distinct points in an explanation of each of two criteria for an appropriate solution for the supply of electricity to communities in remote areas of developing countries [3 max] per way, [6 max].*
the technology must be understood by local communities;
it must be consistent with local skills and resources;
so that it empowers them not subjugates them;
- cost-effectiveness;
extending the National Grid is unlikely to be cost-effective;
there needs to be a localized solution for the supply of electricity;
- the solution needs to be based on renewable resources,
eg hydroelectric, solar and wind;
non-renewable resources are finite;
- the solution should not be based on fossil fuels unless they are particularly abundant in the area;
fossil fuels are non-renewable;
they also generate carbon emissions; [6 max]
12. (a) *Award [1] for identifying an input sensor and [1] for identifying an output device which might be used in a home security system [2 max].*
infra-red sensor/vibration sensor/micro-switch/pressure pad/laser light/video camera;
strobe light/siren/alarm/auto dial for security service/auto lock doors and window shutters/video monitor; [2]
- (b) *Award [1] for identifying the important of refresh rates in a video-monitored home security system and [1] for a brief explanation [2 max].*
the refresh rate determines how frequently an image is captured and transmitted;
a higher refresh rate gives increased smoothness; [2]
- (c) *Award [1] for identifying an ethical issue relating to home security systems and [1] for a brief explanation [2 max].*
privacy and security;
and the issue of intrusion/isolating oneself; [2]

13. (a) *Award [1] for each of three distinct correct points in an explanation of design for dematerialization for consumers [3 max].*

dematerialization is the reduction of weight and use of materials;
makes portable devices such as PDAs, MP3 players and mobile phones easy to carry;
but does not limit functionality;

dematerialization is the reduction of weight and use of materials;
less use of resources;
reducing the effect on the environment;

[3 max]

- (b) *Award [1] for each of three distinct correct points in a discussion of one advantage of electronic products that incorporate upgradeability for consumers [3 max].*

encourages brand loyalty;
brand loyalty promotes continuation of the markets;
profits can be diverted to increased research and development;

promotes re-use or continued use of an existing product;
re-use/continued use of an existing product;
less resource usage/better environment;

cost savings for consumers;
not purchasing brand new products;
benefiting from additional features;

[3 max]

14. *Award [1] for each distinct correct point in an explanation of each of three different considerations for installing a copper wire network in comparison to a fibre optic network [3 max] per type, [9 max] total.*

cost-effectiveness;
lower capital cost than a fibre optic system;
if the system does not require high capacity then a copper wire system may be a most cost-effective solution;

ease of installation;
they are not as fragile as fibre optic cables;
a copper wire system requires less technical expertise than a fibre optic system;

maintenance;
more straightforward maintenance required;
less specialist skill/equipment required;

[9]

Option C — CAD/CAM

15. (a) *Award [1] for stating one advantage to the designer of using FDM rapid prototype manufacturing technology.*
research and development time reduced;
feedback on evolving design;
can rapidly produce detailed/accurate models;
little waste;
cost-effective process once equipment purchased; **[1 max]**
- (b) *Award [1] for each of two distinct correct points in a description of the function of the extrusion head in the FDM process shown in Figure C1 [2 max].*
the extrusion head moves back and forth;
building up the model with layers of molten plastic which then cools rapidly; **[2]**
- (c) *Award [1] for each of three distinct correct points in an explanation of one reason why support material is required when using FDM rapid prototyping techniques [3 max].*
supports are required to provide a good/level surface for the plastic;
as the layers are built up;
and to ensure an appropriate level of detail/surface finish; **[3]**
16. (a) *Award [1] for stating one advantage of replacing hydraulic robots with electrical robots in a manufacturing environment.*
reduced noise;
work to closer tolerances;
require less maintenance;
hydraulic robots tend to leak; **[1 max]**
- (b) *Award [1] identifying one way in which feedback aids development of artificial intelligence in some robots and [1] for a brief explanation [2 max].*
self diagnostic in maintaining quality through sensing environment;
adjust to maintain accuracy;
- use of neural networks;
robots can learn through feedback from their actions; **[2 max]**

17. (a) *Award [1] for identifying an advantage of a CIM system for consumers and [1] for a brief explanation [2 max].*
cost-effective process;
may provide cheaper products;
- individuality;
allows for an element of consumer choice/preference;
- quality control/assurance of product;
manufacturing is totally computerized so eliminates human error; **[2 max]**
- (b) *Award [1] for identifying a disadvantage of adopting a CIM system for a small manufacturing company and [1] for a brief explanation [2 max].*
scale of production;
a CIM system is only cost-effective for high volume production;
- high capital costs;
a CIM system consists of sophisticated equipment; **[2 max]**
18. *Award [1] for each of three distinct correct points in a discussion of two advantages of using virtual reality software in designing new buildings. [3 max] for each advantage, [6 max] total.*
the consumer can visualize the apartment more easily in 3D than 2D;
to get a better impression of what it will look like;
make a more informed decision about whether to go ahead with the purchase;
- consumer can interact with the designer;
can suggest modifications;
ensure the final product is more closely aligned to his/her needs;
- cost saving;
consumer does not have to travel to a 3D model;
can views items easily in different colours etc; **[6]**

19. (a) *Award [1] for identifying one social impact on designers of the increasing use of CAD and [1] for a brief explanation [2 max].*

CAD allows for more multi-tasking;

designers may work more in isolation with the reduced need for teamwork;

CAD allows for a more flexible approach to working;

so designers do not have to be limited to traditional office hours/workspaces;

improved communication with client;

send/adjusted electronically:

[2 max]

- (b) *Award [1] for identifying one implication of the use of CAD for training of designers in a large multinational company and [1] for a brief explanation [2 max].*

cost;

designers need to know how to use specific types of software which can take a long time to learn learn/licensing costs;

complexity;

some CAD software packages are very detailed and require a long time/much expertise to master them;

retraining costs;

programmes regularly updated;

[2 max]

- (c) *Award [1] for identifying one reason why the use of CAM may lead to increased use of resources and [1] for a brief explanation [2 max].*

CAM increases speed of production/consumer choice of products;

this leads to a higher volume of products in the marketplace which results in greater use of resources;

[2]

20. (a) *Award [1] for each of three distinct correct points in an explanation of why some products are manufactured by CAM whilst others may be made using traditional manufacturing techniques [3 max].*

tradition/culture;

market for the product has been established over a long period of time;

no impetus for change;

capital costs for CAM system;

must be confident of continued market for the product;

in order to get a return on your investment within reasonable period;

flexibility in manufacturing;

skilled workforce may be adaptable;

can meet the needs of changing market conditions;

corporate social responsibility;

trained workforce may be important to the local economy/community;

employers want to avoid large-scale unemployment;

market pull;

some consumers may value the nature of the use of the traditional techniques;

they may perceive the products to be prestige products;

[3 max]

- (b) *Award [1] for each of three distinct correct points in an explanation of one way in which CAD allows for flexible manufacture [3 max].*

mobile communication systems;

products can be designed in one part of the world and manufactured in another;

this may be more cost-effective/lower labour costs/availability of energy or material resources;

CAD outputs files are standardized;

outcomes can be manufactured from a variety of CAM techniques;

products can be manufactured on range of different machines in different locations;

changes in market conditions/market pull;

adjusted easily in CAD;

speed of reaction to change:

[3 max]

21. Award [1] for each of three distinct correct points in each of three ways in which CAD/CAM has impacted on the market for furniture from a consumer perspective [3 max] per way, [9 max] total.

there is a wider choice for consumers;
consumers may choose furniture based on price range;
or styles/surface finish/colour;

many designs are modular;
consumers can mix and match;
to suit lifestyle/space available/match with existing furniture;

fixtures and fittings are standardized;
so a limited range of tools are required;
instructions for assembly are included in the pack;

furniture is flat-packed;
can be stored easily by the retailer;
transported by the consumer/promotes impulse buying;

planned obsolescence;
consumers do not expect furniture to last a long time;
so they expect to change the furniture readily;

CAD/CAM requires high scales of production;
cost effective production;
cheaper products for the consumer;

shorter lead times for furniture production;
supports JIT production and reduces storage cost and capital investment in inventory;
reduced costs for customer;

reduced costs for customer;
makes latest styles of furniture quickly/cheaply available to customers;
facilitates ease of distribution;

[9 max]

Option D — Textiles

22. (a) *Award [1] for one reason why the Chinese had a monopoly of silk production for about 3000 years.*
silk production was a closely-guarded secret; *[1]*
- (b) *Award [1] for identifying one way in which the “Silk Road” can be considered the information superhighway of its day and [1] for a brief explanation [2 max].*
the “Silk Road” was a means of transporting goods;
it also promoted the exchange of cultures and knowledge between the east and the west that it passed through; *[2]*
- (c) *Award [1] for each of three distinct correct points in a reason for the continued popularity of silk for clothing [3 max].*
natural/lightweight fabric;
good heat retention and cooling properties;
absorbs sweat/perspiration so skin feels dry and comfortable;
- tradition/culture;
in some parts of the world silk has been used for thousands of years;
there is still a well established manufacturing capability;
- status/image;
silk is viewed as a luxurious fabric;
expensive/used for high quality clothing by rich people;
- texture/drape/silk hangs/falls;
fine silk thread;
creates a tightly woven fabric; *[3 max]*
23. (a) *Award [1] for stating a benefit of adopting the “EU Flower” for a textile company.*
enhanced consumer confidence;
trustworthy supplier;
demonstrates corporate social responsibility;
green image;
expands market/globally recognized standard; *[1 max]*
- (b) *Award [1] for identifying one disadvantage of adopting the “EU Flower” for manufacturers who produce products using several different raw materials [2 max].*
may not be cost effective;
a lengthy/expensive process of accreditation is applied to each raw material; *[2]*

24. (a) *Award [1] for identifying one reason why the hat is made by hand and [1] for a brief explanation [2 max].*
hand crafted look;
desirable;
- cottage industry;
non mechanized environments;
- produced from locally sourced materials;
diversification; **[2 max]**
- (b) *Award [1] for way that the design of the hat could be modified to reduce the cost of manufacture and [1] for a brief explanation [2 max].*
use alternative/raw material;
maintain the design characteristics;
- standardize pattern/design;
enable larger scale production;
- remove tassels;
they are very time-consuming to make; **[2 max]**
25. *Award [1] for each of three distinct correct points in an explanation of each of two ways in which Lycra[®] has contributed to the enhanced performance of racing cyclists [3 max] per way, [6 max] total.*
elastic;
forms to shape of body;
gives the rider a more aerodynamic shape;
- can be combined with other materials, such as cotton;
benefit from properties of both materials;
provides greater comfort; **[6]**

26. (a) *Award [1] for a point and [1] for justification relating to health and safety issues in the photograph.*
unguarded machines;
can get hands/ loose clothing caught;
- child workers are smaller than adults;
more vulnerable to getting caught in machines;
- noisy machine;
causing hearing problems;
- child labour costs less;
unscrupulous manufacturers may use child labour to increase profits, especially in developing countries; **[2 max]**
- (b) *Award [1] for the use of child labour in relation to maintenance issues was popular in the textile industry during the Industrial Revolution and [1] for a brief explanation [2 max].*
children are smaller;
can go inside the machine to fix things more easily;
- child labour costs less;
unscrupulous manufacturers may use child labour to increase profits, especially in developing countries; **[2 max]**
- (c) *Award [1] for one reason why health and safety legislation is variable in the global textile industry and [1] for brief explanation [2 max].*
there is no worker representation to enforce health and safety standards;
different attitudes to corporate responsibilities by different employers;
- there is no health and safety legislation in some countries/legislation standards are different in different countries;
legislation tends to match minimum requirements; **[2 max]**
27. (a) *Award [1] for each of three distinct correct points suggesting a market segment for this type of product [3 max].*
technophiles;
people with a lot of electronic gadgets;
attracted to interesting applications of technology in products;
- people involved in outdoor activities;
with no access to mains power supplies;
who need to power electronic devices; **[3 max]**
- (b) *Award [1] for each of three distinct points in an explanation of how the safety of the wearer can be improved by wearing smart clothing [3 max].*
sensors, for example, body temperature, position of wearer;

action, for example, can monitor if person is getting too hot or cold if in a dangerous situation/wearer can be found if lost/can introduce heat to specific areas that are becoming cold;

consequence, for example, can call emergency services;

[3 max]

- 28.** *Award [1] for each of three distinct correct points in an explanation of each of three ways that the use of computerized manufacture in the textile industry has improved the quality of products [3 max] per way, [9 max] total.*

accuracy;

the precision which can be achieved with CNC machinery;

reduces errors in manufacture;

consistency;

volume production of textile products;

removes human errors;

high volume low cost production;

offering consumers a range of products;

good value for money;

flexibility of the production process/programmability;

in relation to colours/weave patterns;

linking machines into a flexible manufacturing system;

mass customization;

computer technology enables product to be customized;

to meet the individual needs of individual consumers/clients;

[9 max]

Option E — Human factors design

29. (a) Award [1] for stating the type of data scale used for the data shown in Figure E1.
ratio scale; [1]
- (b) Award [1] for identifying why the 5th percentile is used in relation to each of the measurements associated with reach and [1] for a brief explanation [2 max].
to cater for 95% of the user population;
only the very smallest people/less than 5th percentile will not be able to reach; [2]
- (c) Award [1] for each of three distinct correct points in an explanation of why the data for toe projection is given in terms of the 50th and 95th percentiles [3 max].
toe projection limits how close the person can get to an object;
for these dimensions it is the larger percentiles that need special attention;
the 95th percentile is therefore the critical dimension; [3]
30. (a) Award [1] for stating which aspect of the “more four pleasure framework” involves values in design.
ideopleasure; [1]
- (b) Award [1] for identifying one way in which mobile phone design incorporates aspects of the “four pleasure framework” and [1] for a brief explanation [2 max].
ideopleasure;
status as an owner of an expensive/high tech phone;

psychopleasure;
image/style of the phone;

sociopleasure;
a mobile phone is a “must have” item to fit into social groups/to be contactable by members of the group; [2 max]

31. (a) *Award [1] for identifying one reason why able bodied people may have difficulty opening ring pull cans with their fingers and [1] for a brief explanation [2 max].*
fingers too big/fat/very short (bitten down) fingernails;
difficult to lift up the ring pull/ space for fingers too small;
- may not have enough strength to use one finger;
due to infirmity/injury/low dexterity/age;
- amount of force required to open the can;
varies from can to can;
- inequalities in can manufacture;
some ring-pulls require more strength to open them than others; **[2 max]**
- (b) *Award [1] for each of two distinct points in a suitable outline of one potential disadvantage of using the Magipull ring pull can opener for able-bodied people [2 max].*
may apply too much force;
so the contents of the can would spill out/the ring may break off; **[2]**
32. *Award [1] for each distinct point in a suitable comparison of two human factor considerations [3 max] for each consideration [6 max].*
Sure grip cutlery has chunky handles;
the Baroque cutlery has a twisted design and are thinner handles;
the Sure grip handles are easier to hold than the Baroque handles;
- Sure grip handles are made from a non-slip material;
Baroque cutlery handles are made from stainless steel which is shiny/slippery;
Sure grip handles are easier to grip, especially for people with arthritis;
- Sure grip cutlery is designed to fit into the hand;
so the full strength of the arm muscles can be used;
but the Baroque cutlery is held by the fingers and requires more dexterity to use; **[6 max]**

33. (a) *Award [1] for each of two distinct correct points in a suitable outline of one way in which the mood of the bar can be easily altered for different occasions [2 max].*
music;
different types of background music can alter the atmosphere for example, soft classical music for a calm atmosphere;
- lighting;
different levels of light can alter the atmosphere for example, soft lights for an intimate atmosphere;
- use of curtains;
closing the curtains makes the room feel more intimate and vice versa; **[2 max]**
- (b) *Award [1] for a psychological factor relating to the shape of the chairs in the bar and [1] for a brief explanation [2 max].*
curved shapes;
the chair wraps around the user giving the feeling of cosiness/protection;
- wide/large shape;
inviting to use; **[2]**
- (c) *Award [1] for each of two distinct points in a suitable outline of one way in which the designer has used texture to enhance the intimacy of the hotel lounge bar [2 max].*
soft fabrics for the chairs/curtains;
quieter/more peaceful; **[2]**
34. (a) *Award [1] for each distinct correct point in an explanation of one way in which motion capture contributes to the development of a digital human [3 max].*
a motion capture session records the movements of a person;
the captured movements are mapped to a 3D model (robot) created by a computer artist;
so the model can be suitably animated; **[3]**
- (b) *Award [1] for each distinct correct point in an explanation of one way in which digital human technology can be used with percentile data related to reach for wheelchair users for the design of a kitchen [3 max].*
digital humans can be created to represent different percentile ranges for wheelchair users;
so that the reach envelope for wheelchair users can be identified;
in order to ensure that wheelchair users in the normal percentile range can use the kitchen effectively/comfortably; **[3]**

35. Award [1] for each of three distinct points in each of three advantages of paper prototyping in the design of the controls for electronic products [3 max] per advantage, [9 max] total.

cheap/low cost/fast;

as easy to do;

does not require expensive skills/training/time;

just needs a piece of paper and a pen/pencil;

designer can get instant feedback from potential users;

the design can be modified accordingly;

participatory design strategy;

users can input to the design of the product;

ensures customer satisfaction with the final product;

flexibility;

easy to modify;

in relation to feedback from users;

ease-of-communication;

especially for a design team;

platform independent/not reliant on computer technology/no need for computer programming;

[9 max]
