M10/4/DESTE/HP3/ENG/TZ0/XX/M

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MARKSCHEME

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DESIGN TECHNOLOGY

Higher Level

Paper 3

26 pages

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Subject Details: Design Technology HL Paper 3 Markscheme

Mark Allocation

Candidates are required to answer questions from **ONE** of the Options **[1 x 40 marks]**.
Maximum total = **[40 marks]**

1. A markscheme often has more marking points than the total allows. This is intentional. Do **not** award more than the maximum marks allowed for part of a question.

2. Each marking point has a separate line and the end is signified 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 writing ***OWTTE*** (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. Indicate this with **ECF (**error carried forward).

10. Only consider units at the end of a calculation. Unless directed otherwise in the markscheme, unit errors should only be penalized once in the paper. Indicate this by writing **–1(U)** at the first point it occurs and **U** on the cover page.

11. Do not penalize candidates for errors in significant figures unless it is specifically referred to in the markscheme.

Option A — Food science and technology

A1. (a) *Award **[1]** for a definition of unsaturated fatty acid to the effect of:*
one in which there are double bonds present between the carbons of the fatty acid chains; ***[1]***

(b) *Award **[1]** for each of two distinct correct points in a description of the importance of unsaturated fats to health, **[2 max]**.*
good for health;
essential compounds/cannot be produced in body (cell membranes, *etc.*); ***[2]***

(c) *Award **[1]** for each of three distinct points of explanation of the importance of unsaturated fatty acids in the development of rancidity and the shelf life of cooking oils, **[3 max]**.*
double bonds are susceptible to oxidation;
this leads to oxidative rancidity;
this reduces shelf life of product;
off flavours are produced in oil; ***[3]***

A2. (a) *Award **[1]** for a definition of food insecurity to the effect of:*
low levels of food intake which can be transitory (as a result of crisis)/seasonal/chronic (when it occurs on a continuing basis); ***[1]***

(b) *Award **[1]** for each of two distinct correct criteria relating to food security **[2 max]**.*
sufficient food is available;
supplies are relatively stable;
those in need of food can obtain it; ***[2 max]***

A3. (a) *Award **[1]** for each of two functions of the packaging of Coca-Cola.*
maintaining carbonation/keeping drink fizzy;
keeping the contents clean/fresh/safe;
the packaging is labelled to provide information about contents;
marketing/the package enables the promotion of other products;
security/the packaging needs to ensure that the product is not tampered with;
the packaging must be easily opened and resealed to avoid spillage; ***[2 max]***

(b) *Award **[1]** for identifying one way in which the packaging of Coca-Cola has contributed to the development of the Coca-Cola brand and **[1]** for a brief explanation, **[2 max]**.*
the shape of the bottle same as original design/easily recognized;
even when produced in plastic rather than glass/it has become synonymous with the product/what it stands for;

the colour/lettering is consistent and is recognizable even when not on the bottle;
this makes it useful for sponsorship, *e.g.* sports sponsorship;
uses same packaging for family of products;
increases sales/market;

identifiable/recognizable;
promotes consumer confidence/facilitates product launch for new products in family; ***[2 max]***

A4. (a) *Award **[1]** for each of three distinct correct points in an explanation of the significance of the resistance of crops to the herbicide Roundup™.*
genetic modification of soybeans can make them resistant to the herbicide Roundup™ (which contains glyphosate);
thus they are able to grow unaffected/not killed when treated with Roundup™;
when soybean fields are treated with Roundup™ only the weeds die; ***[3 max]***

(b) *Award **[1]** for each of three distinct correct points in a discussion of one reason why manufacturers might not want to label genetically-modified crops or their products.*
in some countries consumers are nervous of GM crops/concerned about the effects of GM foods on humans;
thus GM crops may be less acceptable than non-GM crops;
they therefore might not command as high a price as non-GM crops/may be avoided by consumers;
manufacturers may prefer to focus on positive aspects of product (nutritional information/taste characteristics, *etc*) and hide GM origins; ***[3 max]***

A5. (a) *Award **[1]** for identifying each of the two main categories of bacterial food poisoning **[2 max]**.*
infective bacterial food poisoning;
toxin-type bacterial food poisoning; ***[2 max]***

(b) *Award **[1]** for each of two distinct correct points in a description of the temperature danger zone for bacterial growth, **[2 max]**.*
above 10^{o}C;
below 63^{o}C; ***[2]***

(c) *Award **[1]** for identifying one way in which lifestyle factors contribute to the increased incidence of food poisoning and **[1]** for a brief explanation.*
more people eating away from home;
commercial food production (where food may be kept warm for extended periods) is more risky than small-scale domestic food production (where food is often cooked fresh and eaten immediately);

increased consumption of ready meals;
problems with storage and reheating may lead to increased risk of food poisoning;

increase in microwave cooking for quickness;
consumers may not check that food is thoroughly cooked/ piping hot;

supermarkets have food offers/bulk buys;
consumers may store food too long;

breakdown in tradition of family meals;
decrease in cooking skills; ***[2 max]***

A6. *Award **[1]** for each of three distinct correct points in a discussion of the influence of market pull and of technology push on the development of new food products, e.g. ready meals:*
market pull:
there is increasing demand for lower cost foods;
more people live alone and many people do not have cooking skills;
ready meals can be more cost-effective for single people;

there is an increasing demand for more and more convenience foods;
working women for example may have less time for cooking/families may not want to sit to eat together;
ready meals can be regenerated quickly using microwave/oven heating;

technology push:
freezers/blast chillers;
aid in production of frozen/chilled ready meals;
enhance shelf life of product;

microwaves;
make it easy to regenerate/heat food;
have promoted the development of ready meals;

packaging materials/vacuum packaging;
enhanced properties;
keep food safe/fresh in transit/storage; ***[6 max]***

A7. *Award **[1]** for each of three distinct correct points of explanation of three ways in which on-farm processing can enhance farm sustainability **[9 max]**.*

on-farm processing produces products of higher value than the raw materials from which they are made;
thus a larger share of the food dollar stays in the control of the farmer;
this enhances farm sustainability;

on-farm processing creates more work in local communities;
thus more people can stay and work in rural communities;
jobs related to on-farm processing are more highly skilled and more interesting than traditional farm work;

small-scale food processing can be more appropriate than mass-production;
craft-produced foods/foods of known provenance command higher prices;
on-farm processing of foods represents a very lucrative form of farm diversification;

consumer attitudes;
farm shops/farmers' markets;
have helped change purchasing habits/support for local farmers;

reduced transport costs for farmer;
raw materials do not need to be transported for processing;
saves time/saves money/increases profit/sustainability; ***[9 max]***

Option B – Electronic Product

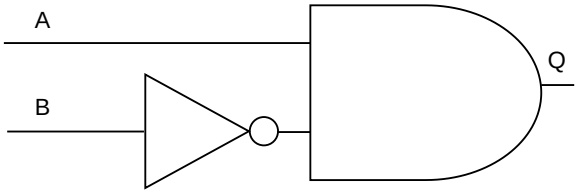
B1. (a) *Award **[1]** for identifying the key component of the temperature sensor.*
thermistor; ***[1]***

(b) *Award **[1]** for Q=1 when A=1 and B=0 and **[1]** for Q=0 in all other instances, **[2 max]**.*

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

[2 max]

(c) *Award **[1]** for the correct symbol for an AND gate; award **[1]** for the AND gate having two inputs A and B; award **[1]** for the correct symbol for the NOT gate on input B, **[3 max]**.*



[3 max]

B2. (a) *Award **[1]** for a definition of nanotechnology to the effect of:*
materials and devices that operate on the nanoscale, *i.e.* with dimensions measured in nanometres;
the branch of engineering that deals with things smaller than 100 nanometers; ***[1]***

(b) *Award **[1]** for each of two distinct correct points in a description of an application of nanotechnology similar to the examples below, **[2 max]**:*
silver nano-crystals have anti-bacterial properties;
they can be used to coat medical equipment to reduce the risk of infection;

zinc oxide crystals absorb ultraviolet light;
they can be used as a sunscreen;

zinc oxide crystals have antimicrobial properties;
they can be used for bacteria-resistant fabrics and surfaces;

silver nano-crystals have antimicrobial properties;
they are used to produce bandages and to coat the surface of refrigerators, air conditioners and washing machines;

plastic nano-composites are strong, light and rust-proof;
they are used for car components, *e.g.* car bumpers;

nano-crystalline calcium phosphate is used to produce artificial bone composites;
they have similar compressive strength to stainless steel; ***[2]***

B3. (a) *Award **[1]** for stating the resistance of thermistor X at $10^{o}C$, including units.*
450–500 Ω; ***[1]***

(b) *Award **[1]** for each of three distinct points in an explanation of how the logic circuit can be used to provide logic 0 when the temperature rises above approximately $10^{o}C$ **[3 max]**.*
above 10^{o}C the value of X falls below 470 Ω;
so the input to the logic gate rises above 2.5 V;
the output switches to logic 0; ***[3]***

B4. (a) *Award **[1]** for each correct distinct point in an explanation of how PICs are integrated into control circuits to implement the smart home concept.*
a range of input and output devices are used to implement the PIC with the real world;
the PIC makes "intelligent" decisions based on pre-programmed protocols;
it reacts to inputs producing outputs to maintain or change environments; ***[3]***

(b) *Award **[1]** for each correct distinct point in an explanation of how a door can be locked and unlocked electronically using PIC technology.*
an electromagnet/solenoid can be used to move a bolt;
current flowing through solenoid in one direction will open the bolt and when flowing in the opposite direction will close the bolt;
an amplifier needed to operate solenoid as PIC outputs do not provide enough current; ***[3 max]***

B5. (a) *Award **[1]** for one implication of product stewardship for designers and **[1]** for a brief explanation.*
designing products that are more easily disassembled;
this makes the components and materials in the product more easily reusable/recyclable;

specifying less toxic materials;
this reduces the environmental impact of the product on disposal;

designing products to be more durable/ easily upgraded/repaired;
increases product life cycle; ***[2 max]***

(b) *Award **[1]** for one way in which take-back legislation will impact on the cost of a product and **[1]** for a brief explanation.*
prices higher;
to cover costs of take-back legislation;

collection and disassembly for disposal/reuse/recycling;
critical element of the product price;

paid at the point of sale by consumers in purchase price;
not at the point of disposal by ratepayers/manufacturers; ***[2]***

(c) *Award **[1]** for one way in which service costs contribute to the replacement of electronic products rather than their repair and **[1]** for a brief explanation.*
service costs include call-out charges/cost of parts/cost of time to undertake the repair;
can be substantial;
may be cheaper to replace products than to repair them; ***[2]***

B6. *Award **[1]** for each of three distinct correct points in an explanation of how a digital hearing aid can be customised to meet the requirements of an individual user initially and through the product lifecycle.*
initially:
audiogram analyses frequency response of an ear;
hearing aid divides (filters) incoming sound into frequency bands;
amplifies where appropriate;
recombines the bands to compensate for hearing deficiencies;

through the product lifecycle:
hearing may deteriorate over time;
a new audiogram can provide the information necessary to re-programme the PIC;
this extends product life; ***[6 max]***

B7. *Award **[1]** for each of three distinct correct points in an explanation of each of three reasons why copper wires are being replaced by fibre optic cables in modern digital communication systems based on frequency division multiplexing, **[9 max]**.*
frequency division multiplexing requires a certain bit rate and therefore bandwidth;
recent applications require a lot more information and therefore bandwidth;
copper cables have much lower bandwidth and hence capacity than fibre optic cables which have a huge bandwidth;

fibre optic cables are based on light;
less vulnerable to electromagnetic interference;
more secure;
many users share links simultaneously;

fibre optic cables are more cost-effective;
copper is expensive, sand is not (fibre optic cable core is made of glass);
less power is needed to run a fibre optic link;
repeaters can be spaced further apart;
copper wires require more maintenance; ***[9 max]***

Option C – CAD / CAM

C1. (a) *Award **[1]** for stating one benefit for the consumer of using knock-down (KD) fittings in the design of the bed shown in Figure C1.*
they are easy to use;
they are very suitable for use for flat-pack furniture;
they can be put together easily;
they use simple tools;
they can be disassembled and reassembled in another location;
they can be disassembled for repair/recycling;
they are suitable for use by unskilled persons; ***[1 max]***

(b) *Award **[1]** for each of two distinct correct points in a description of how the exploded drawing in Figure C1 will help consumers in the assembly process for the wardrobe, **[2 max]**.*
the consumer can check that s/he has all the correct parts/the consumer can see how the parts fit together;
this should make it easier for the consumer to assemble the wardrobe/ the consumer can see what the finished article should look like; ***[2]***

(c) *Award **[1]** for each of three distinct points of discussion of one advantage of using CAM in the manufacture of flat-pack, **[3 max]**.*
quality control;
CAM is a very precise manufacturing process;
can produce parts with low tolerances;
this ensures that the parts fit together accurately;

cost;
CAM is a very cost-effective system;
CAM can minimize price for consumer/increase profit for manufacturer;

mass customization is possible;
subtle changes to the design can be made easily;
the revised design can then be produced cheaply and quickly using CAM; ***[3 max]***

C2. (a) *Award **[1]** for a definition of artificial intelligence to the effect of:*
a computer-based machine or robot that has the ability to learn from information gained through feedback; ***[1]***

(b) *Award **[1]** for identifying one way in which feedback plays an important role in developing artificial intelligence and **[1]** for a brief explanation, **[2 max]**.*
environment feedback provides an input signal to the processor;
a programmed response to the feedback determines the action performed; ***[2 max]***

C3. (a) *Award **[1]** for identifying one way in which the use of CAD has simplified the manufacture of jewellery and **[1]** for a brief explanation, **[2 max]**.*
settings;
a range of settings for the stone can be selected;

communication between the designer and the consumer;
enables collaborative design of product;

patterns;
it is easy to alter the engraved design of the patterns of the ring using CAD;

sizes;
it is very easy to alter the size of the ring using CAD;

virtual products;
reduction in costs as the ring does not have to be produced until a consumer actually wants to make a purchase; ***[2 max]***

(b) *Award **[1]** for identifying one way in which a scanner can be used to aid jewelry design using CAD and **[1]** for a brief explanation, **[2 max]**.*
scan in the image;
manipulate in CAD to produce a new design; ***[2]***

C4. *Award **[1]** for each of three distinct correct points in a discussion of two limitations of using 3-axis machining to make the product in Figure C5, **[6 max]**.*
time;
repositioning of the work piece at different angles is time consuming;
also can result in errors in manufacture;

additional tooling and fixtures are needed to hold the work piece in place;
this can increase the cost and complexity of the manufacturing process;
some parts may challenge production using 3-axis machining; ***[6]***

C5. (a) *Award **[1]** for identifying how CAD has changed the nature of the designer-client relationship and **[1]** for a brief explanation **[2 max]**.*
CAD can support a much closer relationship between the designer and the client;
information exchange can be done electronically enabling the client to be much more involved in the design process; ***[2]***

(b) *Award **[1]** for identifying a reason about how CAD allows for 24 hours a day (24/7) working across time zones and **[1]** for a brief explanation, **[2 max]**.*
allow teams to work in different places;
the team may be located in different time zones which would enable 24 hours a day (24/7) working; ***[2]***

(c) *Award **[1]** for identifying one implication of computerized manufacture on the infringement of copyright laws and **[1]** for a brief explanation.*
it is very easy to copy designs;
slight modification to the design means it can be produced without breaching copyright; ***[2]***

C6. (a) *Award **[1]** for identifying an issue associated with using MDF as a material to make the chair in Figure C4 on a CAM system and **[1]** for each of two distinct correct points of explanation.*
health and safety;
much safer with CAM;
greater distance between cutting tools, dust, *etc.*;

tooling;
high set-up costs for CAM for machining MDF;
needs to be reflected in fixed costs and breakeven;

feed speed;
will determine quality of product;
slower feed higher quality;

surface finishing;
lower quality surface finish with MDF;
traditional materials result in a much higher quality surface finish; ***[3 max]***

(b) *Award **[1]** for identifying an issue associated with the use of CAM to make the chair in Figure C4 to that of using more traditional methods to make the chair shown in Figure C5 and **[1]** for each of two correct points of explanation.*
initial investment;
high set up costs for CAM;
lower set up costs for traditional techniques;

training requirements very different;
CAM requires more technical skills relating to operation of machine;
traditional methods require training related to material handling and use of tools;

cost-effectiveness;
quicker than traditional methods;
enables volume production;

working environment;
cleaner/safer environment with CAM;
traditional methods can be much less clean/safe;

communication;
CAM can enable better communication between client, designer and manufacturer/merging of roles;
traditionally client, design and manufacturer have been very separate;

wastage;
CAM potentially results in lower wastage in production;
wastage may be considerable in traditional production; ***[3 max]***

C7. *Award **[1]** for each of three distinct correct points of discussion of three advantages to the manufacturer of operating a computer integrated manufacturing (CIM) system **[3 max]** per advantage, **[9 max]**.*
staff morale;
better working environment;
staff morale should be enhanced;

reduction of waste;
optimization of material wastage;
this can lead to more efficient use of raw materials;

cost-effectiveness of manufacture;
high set-up costs;
more cost-effective for high volume of production;

quality;
may be more consistent due to higher precision;
actual quality may be lower than with CIM; ***[9 max]***

Option D – Textiles

D1. (a) *Award **[1]** for a definition of biomimetic to the effect of:*
the application of methods and systems found in nature to the study and design of engineering systems and modern technology; ***[1]***

(b) *Award **[1]** for identifying a reason why the bodysuit has to fit like a second skin and **[1]** for a brief explanation **[2 max]**.*
to reduce drag;
the tight fit streamlines the body shape; ***[2]***

(c) *Award **[1]** for each of three distinct correct points in an explanation of why a composite material is used for the manufacture of the bodysuit, **[3 max]**.*
the desired properties of the fabric can be designed in;
the proportion of Lycra® can be adjusted to determine the stretchability of the fabric;
the proportion of polyamide can be adjusted to determine the dimensional stability of the fabric; ***[3]***

D2. (a) *Award **[1]** for identifying one impact of mechanisation in the textile industry on family life of textile workers.*
children working;
families were split up;
shift from a rural environment to an urban environment;
crowded living conditions;
decreased life span;
decreased health/spread of disease;
long working hours/little time off; ***[1 max]***

(b) *Award **[1]** for identifying one impact of automation of textile products on the working conditions of the workforce and **[1]** for a brief explanation, **[2 max]**.*
health and safety;
automated production is safer for the workers than mechanized production;

less social interaction;
fewer employees;

working conditions;
would be cleaner/quieter; ***[2 max]***

D3. (a) *Award **[1]** for each of two distinct correct points in a description of the market for products developed using the embroidery system, **[2 max]**.*
suitable for people wanting one-off products and small volume production;
e.g. sports clubs (or other similar example); ***[2]***

(b) *Award **[1]** for identifying one way in which the embroidery system can help to enhance designer-client relationships and **[1]** for a brief explanation, **[2 max]**.*
interaction with/involvement of client in design process;
enables changes to be made at an appropriate time rather than one product is manufactured and resources/time wasted; ***[2]***

D4. (a) *Award **[1]** for each of three distinct correct points in an explanation of how manufacturers would achieve the "EU Flower" system for a textile product, **[3 max]**.*
undertake product life cycle analysis focusing on criteria set by EU;
supply test data to National Standards Authority which informs EU if product meets criteria;
European Commission publishes award across EU; ***[3]***

(b) *Award **[1]** for each correct distinct point in a discussion of the key environmental impacts associated with the cutting of cotton fabrics **[3 max]**.*
cutting creates waste;
cutting should be done in a way that reduces waste;
waste generally goes to landfill;
therefore waste will need to be recycled to reduce the environmental impact; ***[3 max]***

D5. (a) *Award **[1]** for identifying one input device for use with wearable computing and **[1]** for a brief explanation.*
passive sensors, *e.g.* heat/light sensors/heart rate monitors/body temperature monitors;
can be used to monitor environments and adjust temperature/*etc.* accordingly;

adapted keyboards, *e.g.* in pocket linings/wireless/bluetooth;
user can input "on the move"/in a range of environments, *e.g.* domestic and public spaces;

microphone;
allows voice and other sounds as inputs; ***[2 max]***

(b) *Award **[1]** for identifying an obstacle to the expansion of the wearable computing market and **[1]** for a brief explanation.*
cost;
wearable computing garments are expensive;

need;
people may not need the functionality that wearable computing garments provide;

fashion;
rapidly changes and development times for wearable computing garments may not be rapid enough for fashion market/wearable computing garments may not be "cool";

health and safety;
in some circumstances, *e.g.* in airports and high risk environments, wearable computing garments may not meet health and safety requirements;

distinctiveness;
wearable computing garments may not be distinctive enough; ***[2 max]***

(c) *Award **[1]** for one benefit of laser welding as a joining technique for the manufacture of wearable computing garments and **[1]** for a brief explanation.*
no holes in fabric;
stitching or alternative joining may create holes in fabric, laser welding does not;

strength;
the resultant garment has a stronger seam and will have better performance characteristics;

reduced labour needs;
laser welding reduces manufacturing costs;

ease of automation;
laser welding can be more easily automated than other joining techniques;

sealing of seams;
wires and connectors are totally sealed which is an advantage during laundering, *etc.*; ***[2 max]***

D6. *Award **[1]** for each of three distinct correct points in a discussion of two advantages of using SMART textiles in cars **[3 max]** per advantage, **[6 max]**.*
comfort sensors in textiles used for seats;
detect comfort levels of driver/passenger;
adjust temperature, *etc.* accordingly;

"triple fresh" and similar treatments on carpets;
decompose pollutants – cigarette/animal smells;
keep car smelling fresh;

detectors to check if driver asleep or awake;
if driver asleep apply brakes;
this will ensure road safety; ***[6 max]***

D7. *Award **[1]** for each of three distinct correct points in an explanation of each of three ways in which finishing processes are used to modify the performance characteristics of textile products **[3 max]** per way, **[9 max]**.*
fire retardancy;
textiles, *e.g.* curtains and children's night attire, may be coated with flame retardant substance;
this may reduce their flammability and contribute to safety issues;

waterproofing;
e.g. of rainwear/tents/*etc.*;
prevent them being wetted;

durability;
protective finish can extend product life;
reduction of microbiological damage/increased resistance to chemicals;

enhance/modify textile properties;
increase performance in use;
e.g. absorbency/elasticity;

soil release;
coating textiles may ensure that soil cannot penetrate fibres of textile;
useful for carpets to prevent soiling from shoes, animals, *etc.*;

ease of maintenance;
fabrics can be treated to make them easy to iron;
this will reduce time/effort in laundry; ***[9 max]***

Option E – Human factors design

E1. (a) *Award **[1]** for one advantage:*
cheap/low cost;
easy to do;
accessible;
quick;
easily modified;
design can be developed quickly;
makes communication easier between team members; ***[1 max]***

(b) *Award **[2]** for:*
it involves users;
in development of a design; ***[2]***

(c) *Award **[1]** for each point in an explanation.*
the user represents the target market;
under guidance from the facilitator;
the user provides feedback on the user–product interface; ***[3]***

E2. (a) *Award **[1]** for any of the following advantages.*
reduces cost of animation;
accurately represents human movement;
saves time;
creates more natural movements than manual animation; ***[1 max]***

(b) *Award **[1]** for identifying one way and **[1]** for a reason.*
more design iterations;
in less time;

higher product quality;
more accurately represents human requirements;

more efficiency;
from enhanced automation of the development process/faster than humans in carrying out tasks; ***[2 max]***

E3. (a) *Award **[2]** for a description along the lines of:*
they show the interaction of the user with objects in the kitchen;
and frequency of use for a specific task; ***[2]***

(b) *Award **[2]** for a suitable outline.*
an efficient arrangement of products and fixtures;
reduces travel and lessens the chances of an accident *e.g.* when carrying heavy pans/pans with hot liquids; ***[2]***

E4. *Award **[1]** per distinct point in a suitable discussion of each issue **[3 max]** × 2*
layout (a) is the most logical design based on human factors;
as it is easy to identify which controls operate which hob;
layout (c) is more space efficient but may not be obvious which controls operate which hob;

layout (b) is a compromise between (a) and (c);
but the shape is odd;
and would not be suitable for a standardised fitted kitchen;

although (c) is better for aesthetics;
and fitting in with other appliances;
it is not as easy to identify which control knobs operate which hob;

(c) is less safe than the other arrangements;
when all four hobs are in use;
because the user has to lean over the pans on the front hobs to reach pans on the rear hobs; ***[6 max]***

E5. (a) *Award **[1]** for each of two points in an outline of one advantage.*
disability groups in one country may be a small market;
but the amount of groups worldwide add up to a large market;

a large global market;
makes the manufacture of products more cost-effective;

reaching a global market can improve the company's reputation;
and lead to more sales;

economies of scale due to larger market;
can result in cheaper products;

if the global market is large for products;
the manufacturer may decide to open factories in different regions of the world to reduce costs; ***[2 max]***

(b) *Award **[1]** for each of two points in an outline of one benefit.*
consumers can interact with other consumers with the same disability;
leading to recommendations of products based on satisfactory use;

consumers have access to products worldwide;
which would be difficult to find without the resources of the internet;

access to detailed information about products is available;
so consumers may make an informed choice;

information can be accessed from home;
rather than a costly/difficult trip to a retail outlet;

flexibility of access to information on products;
as the internet can be used 24/7;

speed of access to information;
the internet is much quicker than searching for information/products by other means; ***[2 max]***

(c) *Award **[1]** for each of two points in the identification of one barrier.*
it is difficult to legislate for circumstances in different parts of the world;
as community facilities are not standardized;

people's reactions to inclusivity varies;
so legislation may not work successfully in different regions;

economics;
legislation may be too costly for some communities;

obtaining accurate data to base the legislation on;
may not be possible on a global scale; ***[2 max]***

E6. (a) *Award **[1]** for each point.*
drivers can recognize signs easily;
new systems do not have to be learnt in each different country;
fast sign recognition makes travelling safer;
economies of scale in manufacturing signs; ***[3 max]***

(b) *Award **[1]** for each point in a suitable explanation.*
decision sight distance;
driver's eyesight varies;
so deciding what distance signs should be readable is difficult;

positioning of signs;
so drivers' views are not obscured;
causing them to divert attention from driving;

size of signs and letters/symbols;
so drivers can easily absorb information;
without diverting attention from driving;

distance;
so drivers have enough time to act upon the information;
without disrupting the flow of driving;

information coding;
so drivers from different nations;
can easily understand the information; ***[3 max]***

E7. *Award **[1]** per distinct point in a suitable discussion **[3 max]** × 3*
space is often allocated based on standardized tasks;
but different individuals have different personal space needs;
and may be uncomfortable/compromised by the pre-determined layout;

lack of flexibility;
a standardized layout does not offer individuals the opportunity to customize their personal space;
to match their needs;

research used to decide on the standardized layout;
may be generic in nature;
and not appropriate for the needs of all types of office;

standardization may make the office environment safer;
as cables *etc.* can be hidden;
reducing trip hazard risks;

use of standard fixtures;
may provide an unappealing environment;
which constrains user satisfaction reducing efficiency;

standardized products and components;
do not take into account variations in human sizes;
as one size does not fit all;

psychological factors such as temperature and light;
may be standardized throughout the office;
but individual's needs vary;

perception;
a standardized layout may meet the functional requirements of the office;
but users may have a different perception of the suitability of the layout; ***[9 max]***