1 New and emerging technologies

1 Repetitive tasks can be carried out by robots or computer-controlled machinery. The use of automation can speed up tasks and ensure that tasks are completed with precision and consistency. Machinery can be left to run continuously for hours or days as human input is not needed.

2 This is where products are sold on the internet.

3 Any relevant example, for example, the Apple iPad.

4 Designers should ensure that they design products that are accessible to everyone in society. People change as they age: the ability to see and hear and the range of movement alters. Designers should consider whether their products can still be used by all groups of people, the elderly being just one example. Designers should consider different cultural groups and take care to avoid offending when they design their products.

5 JIT stands for ‘just in time’ production and is when a manufacturer ensures that the parts needed to make a product are delivered onto the production line just in time for assembly. This means that they do not need to store items in warehouses.

2 Energy generation and storage

1 Fuel is burnt.
Water is heated to make steam.
Steam is used to turn turbines.
Turbines turn generators.
Electrical power is produced.

2 Burning plants as a fuel source can release harmful gases into the atmosphere and cause pollution.

3 Clockwork is based upon the principle of a spring being wound tightly and being forced into a smaller space. This means potential energy is stored and released using system of gears.

3 Developments in new materials

1 Anodising

2 Renewable – therefore we will not run out of this material.

Environmentally friendly – the growing and processing of corn starch polymers does not negatively affect the environment.
Bio-degradable – if sent to landfill corn starch polymers will rot down.
Food safe – corn starch polymers do affect the food in anyway.
Cost effective – corn starch polymers are less expensive that polymers derived from oil.

3 A smart material is a material that reacts to environmental changes.

4 Strength – CFRP is very strong as it has a mesh of carbon fibre impregnated with resin.
Mouldability – CFRP can be moulded into virtually any shape.
Weight – CFRP has a low mass when compared to metals.
Water and chemical resistance – CFRP does not react or degrade when in contact with water or most chemicals

5 Gore-Tex – walking jackets
Microfibres – sports clothing
Kevlar – body armour
Fire-resistant fabrics – firefighters’ uniforms
E-textiles – fencing jacket

4 Systems approach to designing

1 Light-dependant resistor
Thermistor
Switches

2 The flow of the electrical current alters depending upon the amount of light it is exposed to.

3 Passive infrared detector (PIR)

4 A microcontroller takes the input signal from an input device and processes this information to control an output device.

5 LED
Buzzer
Speaker

5 Mechanical devices

1 A pendulum on a clock

2 A wheelbarrow
3 A rotational force that is exerted on a shaft
4 A cam is attached to a shaft and turns around. The cam has a lobe or an eccentric on its outer edge. As the cam turns, it pushes against a follower. The cam has a rotary motion and the follower has a reciprocating motion.
5 The larger driven pulley will rotate slower than the driver pulley but have a greater torque.

6 Materials and their working properties
1 Corrugated card has a fluted layer which gives the material strength but means it is still lightweight.
2 Student’s own answer.
3 They have needles not leaves. The stay green all year round.
   The have cones not fruit. They are relatively quick growing. They produce softwood.
4 PET
5 It is lightweight/low mass
   It has a good strength to weight ratio.
   It does not rust.
6 Synthetic fibres are mostly made from oil-based chemicals.
7 Reasons for blending fibres:
   To make a fabric with specific qualities for the product
   To make fabrics more crease resistant
   To make fabrics easier to care for
   To reduce the cost of the fabric
   To make a fabric stronger
   To allow fabrics to be heat set.

15 Surface treatments and finishes
1 Using organic cotton that is grown without the use of chemical pesticides and fertilisers.
   Using more sustainable regenerated fibres such as Tencel and modal to replace cotton.
   Replace traditional polyester made from petrochemicals with Ingeo, a biodegradable fibre, or polyester made from recycled plastic bottles.
   Grow cotton fibres already coloured or use newer disperse dyes that use very little water in their application and do not wash out of the fabric during laundering. This will reduce the chemicals and water used in traditional dyeing methods as well as the pollution of waterways.

Avoid the use of chemical finishes and treatments such as stain resistance if possible and make sure that waste from these processes is disposed of properly so as not to pollute waterways.
Where possible, make products near to where they are to be sold and use more ecological forms of transport and fuel to help preserve the earth’s finite supply of oil and reduce carbon emissions into the environment.
Reuse, recycle and repair textile products to help reduce waste sent to landfill.

2 Stretch fabrics containing elastane
   Lightweight Polartec
   Lightweight breathable fabrics made with microfibres
   Moisture management fabrics, for example, Coolmax
   Breathable and windproof waterproof fabrics such as Gore-Tex
   Strong, heat-resistant fabrics such as Kevlar and Nomex
   Neoprene – a synthetic rubber
   Microencapsulated fabrics
   Interactive fabrics with wearable electronics
3 The warp yarns are fixed in the loom and run down the length of the fabric. The weft yarns interlace at right angles with the warp yarns and run across the width of the fabric.
4 The pattern will be checked:
   to make sure that the size of the pattern is correct,
   to ensure that the repeat along the length and across the width of the fabric is accurate,
   to check that the colour is consistent throughout,
   to make sure that different parts of the pattern are placed accurately on the fabric.
5 a) Double machined seam
   b) It is strong, flat, decorative.

16 Investigation, primary and secondary data
1 Taking photographs of products you might use as inspiration
   Gathering feedback through a questionnaire
   Interviewing a client
2 Anthropometrics are the measurements of the human body, collected to help designers size products correctly for their target audience.
   Ergonomics is the consideration of ‘man’ in his environment and how user-friendly/efficient a product can be designed.
3 Lists of materials needed
Scale drawing of the product
Tools and equipment to be used

4 Physiological
Psychological
Sociological

5 New information might be gained from the client which could alter the product outcome.

17 Environmental, social and economic challenge

1 Pollution and harmful gases are changing the Earth’s atmosphere and are preventing the heat of the sun from escaping back into space, meaning these gases are trapped and heating the Earth and increasing the planet’s climate.

2 Consumables such as coffee and chocolate

3 Material that comes from managed forests like those with the FSC logo on them, mean that every effort goes into ensuring that trees are replanted and resources will not run out. This means that the products they are made into are not impacting on the environment by depleting the material resource.

4 Fair trade aims to give fair and better trading opportunities to producers in developing countries, gaining them the highest price for the products they export.

5 A designer can minimise the impact their product has on the environment by considering the product’s life cycle from materials used, energy needed in its use and ultimately the way it would be disposed. Designers should remember the six R’s when designing. They would decide what appropriate and responsibly sourced materials could be used to manufacture the product, such as FSC timbers or maximising the use of recycled wood/pulp/paper.

18 The work of others

1 He was a student and teacher at the Bauhaus in Germany.
An iconic product he designed is the Wassily chair.
Breuer used new materials and technologies in his work.
He used tubular steel extensively in his work as it was easy to use in mass production and was affordable.

2 Philippe Starck designed the Juicy Saliff

3 Student’s own answer

4 Post modernism – 1970-90. Products were designed in a way that sparked interest and controversy. Postmodernist designers such as those from the Memphis Movement produced products that were complex and contradictory.

5 Sir Alec Issigonis designed the mini which was small, compact and reliable. It could still seat four passengers as the engine was turned so that it sat ‘transverse’ making more space. The car was inexpensive and fuel-efficient meaning it was accessible to a larger target audience.

19 Design strategies

1 Collaboration – working with others
User centred-design – having a client at the centre of the design process
Natural form (biomimicry) – using nature as inspiration

2 Using the client throughout the design process means that they can offer ideas and feedback to help a design idea develop. The client can assist with analysing the task and offering opinions about design ideas. This feedback allows designers to improve existing products.

3 Designing as a group means that a wider range of ideas and possibilities can be explored and discussed and a greater understanding of what is required for the design can be achieved.

20 Communication of design ideas

1 Plan view, front elevation, side elevation

2 The product drawn looks realistic.

3 Cardboard – inexpensive, readily available
Foam board – good for structural modelling
Styrofoam – can give a 3D representation of the size/shape of a product
MDF – easy to work with
Clay – easily moulded and can test ergonomics

4 CAD allows a prototype to be accurately drawn and shown on a computer. It can show all aspects of a prototype and can suggest the aesthetics. Programmes such as Photoshop, SketchUp and ProDESKTOP can allow a designer to quickly draw in 3D and render a product.

21 Prototype development

1 CAD is used to produce virtual prototypes of the final product. These can be shown to the client and feedback gained. The aesthetics of the product can be developed further and options given to the client very quickly and easily without a physical model being made.
CAM and the use of rapid prototyping means that complex and working models can be produced quickly and accurately from less expensive materials.
2 Complex and moving parts can be printed to give a very accurate representation of the final product.
3 Designers and manufacturers can tell if their product is fit for purpose.
   Modifications can be made in light of client feedback.
   Rigorous testing for safety can be carried out.
4 Prototypes are tested to check their functionality, their fitness for purpose and their safe and efficient manufacture.

27 Surface treatments and finishes

1 They must all face in the same direction.
2 For example, fabric must be washable as they are likely to be worn for leisure activities; hard-wearing so that they last at least one season; abrasion resistant so that they do not wear out at the knees; thermoplastic so pleats/creases can be heat set; stain resistant so that they stay clean for longer; lightweight so they can be used for active leisure pursuits.
3 Fabric will not hang correctly; patterns in the fabric will not be ‘straight’ and pleasing to look at.
4 To make sure that work is flat and ready for the next process.
5 A ball point needle.
Core technical principles

1 A
2 A
3 C
4 C
5 B
6 C
7 D
8 One way to enhance the properties of paper and card is by encapsulating them in a polymer. Paper and card can be placed in between two sheets of a polymer and heated to soften the polymer and fuse the edges together. This provides a waterproof finish to the paper/card and provides a shiny, wipe-clean finish making it ideal for use on menus, for example.
9 Polyamide is strong, abrasion resistant, lightweight, non-absorbent.
10 Cotton, linen, wool.
11 They can shrink when washed, take a long time to dry, can irritate the skin,
12 They are very stretchy, give a close fit to the body, allow freedom of movement.
13 The fabric burns fiercely at high temperature; gives off toxic black smoke; the polyester fibres melt and drip which can cause serious skin burns.
14 Linear
   Rotary
   Reciprocating
   Oscillating
15 A finite resource is one that will eventually run out.
16 Corn starch polymers are made from vegetables such as potatoes, corn and maze and are therefore renewable.
   Corn starch polymers are biodegradable.
   Corn starch polymers are food-safe.
17 A material that is made from 2 or more materials. It improves both the physical and mechanical properties of the original material.
18 Light dependant resistor (LDR)
   Thermistor
   Any type of switch

Parallel motion linkage

19

20 1:4
21 Properties: lightweight, soft, easy to work
   Uses: models, toy aeroplanes and fishing floats
22 A ferrous metal contains iron.
23 Properties: hard, tough, corrosion resistant
   Uses: kitchen sinks, cutlery
24 A

Specialist technical principles

1 C
2 C
3 A separate line of manufacture for some parts of a product that are later added to the main assembly line
4 To prevent stretching; to strengthen it; to reinforce fabric behind fastenings
5 Student should describe preparation of fabric, tools and equipment used, detail of applying dye and effects achieved.
6 Deforestation occurs when trees are cut down and not replanted.
7 Wood then becomes a finite resource.
   Animals lose their habitat.
   Fertile soil is washed away.
   People lose their livelihood.

Designing and making principles

1 For example, in the use of colour and pattern; interests of TMG such as music; influence of celebrities, religious beliefs of TMG.
2. For example, patchwork pieces; appliqué shapes; specific parts of a product where large differences will be noticeable, such as pockets; specific parts of a garment where other pieces need to fit accurately, such as collars on necklines.

3. The pattern template must be placed on the straight grain of the fabric (usually the warp yarn) so that the fabric will hang correctly as intended in the final product. This may cause garments to twist out of shape on the body. Patterns printed or woven into the fabric will appear to be crooked if the straight grain is not used accurately.

4. Batch manufacture.
   The tops will only be sold during the summer season before new styles come into season. The tops will be made in a range of sizes by workers who are skilled in the use of different machines and processes, so can easily change from making one type of product to a different one when fashions change. Using batch manufacture means that there will not be a lot of unsold stock at the end of the season, especially if computerised systems are used to monitor what is selling.

5. a) Ball point needle
    b) Bodkin

6. Methods include pleats, tucks, gathers, darts. Description should include reference to measuring/marking of fabric, tools used, detail of method and effect created.

7. The thickness of the fabric; if the fabric frays a lot; whether the product will be washed.

8. They are designed specifically for the intended job and can be used to mark out the same shape a number of times.