Now test yourself – Answers

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.

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 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 treatment and finishes

1 Recycle – to shred and re-process paper and card products back into sheet material to be made into new products (for example, packaging).
2 Reduce – use less paper and card in packaging so that less raw material is needed.
3 Reuse – use the paper or card product in its original form for a different purpose so that no processing is needed.
4 Repair – mend or fix a product so that a new one doesn’t need to be bought.
5 Refuse – consumers refuse to buy products (for example, card or paper products that do not use FSC raw materials). Rethink – designers look at new ways to design products to reduce the impact they have on the environment.

2 Images are put onto aluminium plates using UV light. The plates are then treated with chemicals so the non-image area absorbs water. Plates are dampened where ink is not needed. Ink is transferred onto the plate and sticks only to the image area. The image is then printed in reverse onto a cylinder which prints again the correct way onto the material.
3 A registration mark is used in printing to ensure that the layers of colour (CMYK) are in alignment with one another and don’t cast shadows. This will make sure the image that is printed is clear.
4 Insulation would need to be a property that is considered as the pizza would need to say warm when transported. The ability to be printed onto would also need to be a consideration as the company would want to advertise their product.

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 Salif

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

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.
22 Specialist techniques and processes

1 By placing the shapes or nets as close to one another on a sheet of material there is less material wasted and the maximum number of products produced.

2 Many shapes/nets can be cut together.

3 Precision and accuracy can be achieved to cut out intricate designs.

4 Tolerance is the allowable variation of a dimension.

5 Encapsulation is a way to finish papers and boards. The sheet of material is placed between two polymer layers which are then heated to encase the sheet of paper and board inside. This gives the paper/board a shiny and waterproof layer.
Exam practice – Answers

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

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 B
2 B
3 C

4 Fewer trees will need to be cut down, which means that there is less risk of deforestation

5 Sheet, roll and ply

6 Using stock forms allows products to be designed to ensure there is minimal waste when they are manufactured.

Designing and making principles

1 D
2 C

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

4 Any of the following:
   Printing using lithography
   Embossing
   Varnishing
   Foil blocking
5  Deforestation occurs when trees are cut down and not replanted.
6  Wood then becomes a finite resource.

Animals lose their habitat.
Fertile soil is washed away.
People lose their livelihood.