Design & Technology
A-Level

Effects of technological developments
Multiple Choice

Materials required for questions

- Pencil
- Rubber
- Calculator

Instructions

- Use black ink or ball-point pen
- Try answer all questions
- Use the space provided to answer questions
- Calculators can be used if necessary
- Use a cross in the box to mark you answer 

Advice

- Marks for each question are in brackets
- Read each question fully
- Try to answer every question
- Don’t spend too much time on one question

Good luck!

Q1. What is the definition of a smart material?

A A material that has been engineered to have additional properties ☐

B A material whose physical properties change in response to external stimuli ☐

C A material that is available in large sheets ☐

Q2. Smart materials have?

A Properties that can significantly change ☐

B Good conducting properties ☐

C Weak covalent bonds ☐

Q3. Which of the following statements is false about mass production?

A Increased sales/profits ☐

B consumers have less choice ☐

C cheaper materials can be used ☐

Q4. Which of the following statements about technology is false?

A	Lithium-ion rechargeable batteries providing a lightweight means of storing a lot of energy resulting in thinner and fuel cells	☐
B	Computers have resulted in slow-turn Around jobs	☐
C	CIM systems incorporating CAD and CAM used in modern manufacturing	☐

Q5. Discuss the advantages and disadvantages of using CAD for virtual modelling and testing designs **(6 marks)**

Q6. Outline the negative effects mass-production has had on employment **(4 marks)**

Q7. Shape memory alloys are often used in fire alarms and air-conditioning units.
Explain the smart property of a shape memory alloy that makes it suitable for these applications **(2 marks)**

Q8. Discuss how computer-aided design and manufacture (CAD/CAM) have enabled graphic designers to produce creative designs faster and at lower cost than by using traditional drawing methods. **(8 marks)**

Q9. New technologies have transformed products in innovative ways.
Smart glass is often used in the glazing of buildings.
Discuss the benefits of using smart glass in this application. **(3 marks)**

Answers

Q1. B
Q2. A
Q3. B
Q4. B

Q5.

Indicative content
Discussion to address the following issues:

Advantages

- Can test weights/destructive testing
- Can simulate production times
- Calculate material costs
- Files can be transferred electronically
- Ideas easily edited/amended
- Library of standard components/stock size materials
- Anthropometrics/Ergonomic data accessed via databases
- Can be output to 3D printing
- Can view design from all angles
- Colours and textures can be changed easily
- Easily dimensioned for cutting lists
- No need to purchase modelling materials
- Reduced demand on resistant / compliant materials for modelling

Disadvantages

- High cost/expensive set up
- Highly skilled operative required / training issues
- Power-cuts can lose work/loss of files if not backed up
- Unable to physically test until prototype is produced
- Continual development/upgrade of software/hardware required
- Potential threat of hacking / cyber theft / ransom

(Cap marks at a maximum of 4 if candidates
only present advantages or disadvantages
and not both)

Q6.

1. Workers replaced by machines (1)
2. Low job satisfaction/ morale/ self-pride in the work (1)
3. Low wages (1)
4. Poor quality living conditions/ poverty (1)

5. Sweatshop employment/ long hours/ few breaks (women/children) (1)
6. Poor/ unsafe/ bad working conditions (1)
7. Uprisings/ strikes/ friction/ resentment (1)
8. Unemployment/ less employment/ less demand for labour (1)
(4 x 1)

Q7.
Any two of the following:
A change in stimulus (temperature/electricity) (1)
produces a change in shape/movement (1)
(2 x 1)

Q8.
Any eight of the following statements in a sentence, up to a maximum of 8 marks.
• Software allows designers to work individually or in teams (1)
• CAD used throughout the design process allows for quick editing / modifying in light of client feedback (1)
• Detailed engineering drawings can be generated from 3D models / drawings and give manufacturing information very quickly (1)
• Computer modelling can visually test ideas / components on screen (1)
• CAD can virtually test designs under load and simulated operational conditions (1)
• CAD gives photorealistic images suitable for marketing / brochures (1)
• CAD reduces the need for labour intensive drawing offices (1)
• CAD data easily transferred electronically (1)
• Individual drawings can be stored in libraries on file and allows designers to call on them at any time (1)
• Allows for zoom in and out when drawing to scale (1)
• Allows for cut, paste, rotate, mirror images at speed so redrawing not needed (1)
• Mistakes and changes can be easily edited/do not require total redraw (1)
• CAD incorporates tools to add common manufacturing/engineering operations such as internal/external threads, knurling, chamfer, radius etc (1)
• Can add textures/rendering/shadows/materials to make it look realistic (1)
• CAD facilitates the use of rapid prototyping to facilitate the testing and evaluation of designs/gain client approval (1)
• CAD allows 3D virtual modelling that can be rotated and viewed from any angle (1)

• Software is integrated so changes to one part (or view) of the design automatically marks changes to corresponding parts (or views) of the design (1)
• Automatic dimensioning of the design (1)
• Virtual models can be superimposed onto photographic images to test the aesthetics of the product in its proposed environment (1)
• CAD can be used to produce simulations/virtual 'walkthroughs' or 'flypasts' for presentation to a client (1)
• Any appropriate specific cost advantage identified (1)
(8 x 1)

Q9.

A response that identifies any three of the following marking points. Candidate responses must be relevant to Smart Glass in order to get credit for any of the below; for e.g do not accept answers relating to Photochromic glass.
• Provides shade from harmful UV rays reduce glare (1)
• Glass can change opacity properties / tint the window (by the application of electric input) (1)
• Provides privacy when made opaque (1)
• Can be used for energy saving windows to prevent heat passing (1)
• can reduce secondary greenhouse emissions through excessive heating/a-c (1)
• can be used for advertising/promotion/gimmick (1)
• eliminates need to blinds/curtains (1)
• reduces gold fish bowl effect in/out side (1)
• Allows control of natural light levels (1)
(3x1)