

# Design & Technology

## A-Level

# Effects of technological developments

## Multiple Choice

### Materials required for questions

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- Pencil
- Rubber
- Calculator

### Instructions

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- 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

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- 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? - self

**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? - self

**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

☐

**Q7.** Discuss the advantages and disadvantages of using CAD for virtual modelling and testing designs **(6 marks)** – edexcel 2017

[illegible]

**Q8.** Outline the negative effects mass-production has had on employment **(4 marks)** – edexcel 2016

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**Q9.** 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)** – edexcel 2014

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**Q10.** 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)** – edexcel 2014

**Q11.** 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)**  
-edexcel 2013

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## **Answers**

**Q1. B**

**Q2. A**

**Q3. B**

**Q4. B**

**Q5. A**

**Q6. C**

**Q6. A**

**Q7.**

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)

#### **Q8.**

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)

#### **Q9.**

Any two of the following:

A change in stimulus (temperature/electricity) (1)

produces a change in shape/movement (1)

(2 x 1)

#### **Q10.**

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)

### **Q11.**

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)