

D&T Smart materials

Smart materials react to their environment

They change their properties when their surroundings change

Activities-

- Read and highlight key points
- Make a Mind Map or diagram for each sub heading
- Include names, properties, examples and possible uses / products
- Make flash cards with facts on the front and answers on the back
- Test yourself on each topic every three weeks (different each week)
- Get family and or friends to test you

Smart materials

thermochromic inks.

photochromic inks

- piezoelectric materials,
- magneto-rheostatic materials, e
- lectro-rheostatic materials,
- shape memory alloys.

Task s : Find good examples for each smart material to use in the exam and include the following key points

- Benefits & properties above ordinary materials
- Where they would be used and why this helps the user

Task1 : write an explanation and example

Use the video link to see how **Polymorph** can be used to quickly and easily model and edit things in solid plastic – for example special needs products like knife handles .

<https://youtu.be/lhVuc6RNYaw>

Task 2 : Nitinol

Use the video link to see how this works. Find a good example to write about in the exam

<https://youtu.be/i903knvi3qM>

Task 3:

Make a mind map of **all** the examples of smart material to use in the exam and include the following key points – You can use the **Knowledge Organiser** to help you with this

- Benefits & properties above ordinary materials
- Where they would be used and why this helps the user

Use

www.Technology student . com

https://www.ted.com/talks/catarina_mota_play_with_smart_materials

Smart materials have one or more properties/features that can respond to external stimuli, such as stress, light, temperature, moisture, pH, electric or magnetic fields and return to their original state when the stimuli is removed.

Examples include:-

Polymorph

Polymorph is a thermoplastic material that can be shaped and reshaped any number of times. It is normally supplied as granules that look like small plastic beads. In the classroom it can be heated in hot water and when it reaches 62 degrees centigrade the granules form a mass of 'clear' material. When removed from the hot water it can be shaped into almost any form and on cooling it becomes as solid as a material such as nylon.

Although expensive, polymorph is suitable for 3D modelling as it can be shaped by hand or pressed into a shape through the use of a mould.



Task : write an explanation and example

Use the video link to see how Polymorph can be used to quickly and easily model and edit things in solid plastic – for example special needs products like knife handles .

<https://youtu.be/lhVuc6RNYaw>



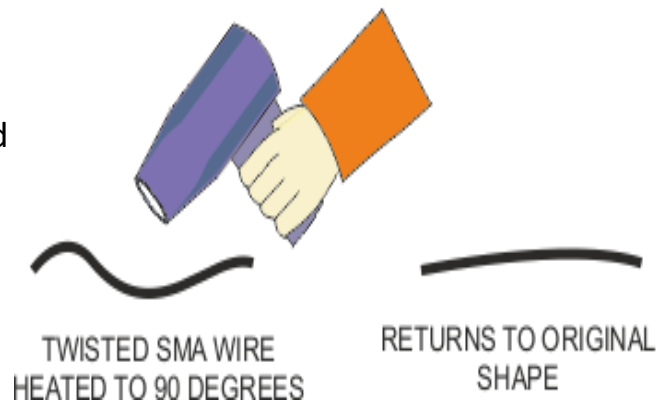
Shape memory alloys = Nitinol an alloy of Nichol and Titanium

SMART MATERIALS

SHAPE MEMORY ALLOY (SMA)

SMA wire also called 'Nitinol', as it is composed of nickel and titanium. Looks like ordinary wire and has many of the same properties.

SMA has a memory - for example, if it is folded to form a shape and then heated above 90 degrees (centigrade) it returns to its original shape.



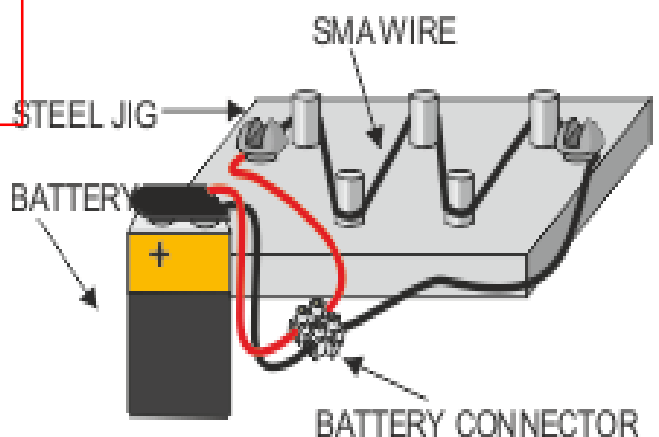
Task 2 :

Use the video link to see how this works

Find a good example to write about in the exam

<https://youtu.be/i903knvi3qM>

SMA can be 'programmed' to remember a shape. Clamp the SMA in position and pass an electric current through it. If the wire is now folded into another shape and then placed in hot water, it returns to the original 'programmed' shape.



Thermo chromic pigments change colour with heat



Can you explain explain the benefits for each of these examples ?



Photo chromic pigments change colour reversibly in response to light

Can you give examples where this material would be a benefit?



Glow in the dark

Phosphorescent pigments store light that hits them and slowly release it, so they glow in the dark if they have been charged by Ultra Violet light



High Visibility
Flourescent

Flourescent pigments are really bright because they absorb light energy and then release them slowly which means they appear brighter than normal pigments



• Reflective finishes include reflective yarns, inks and coatings

Task 3: Make a mind map of all the **examples** of smart material to use in the exam and include the following key points

- Benefits & properties above ordinary materials
- Where they would be used and why this helps the user